

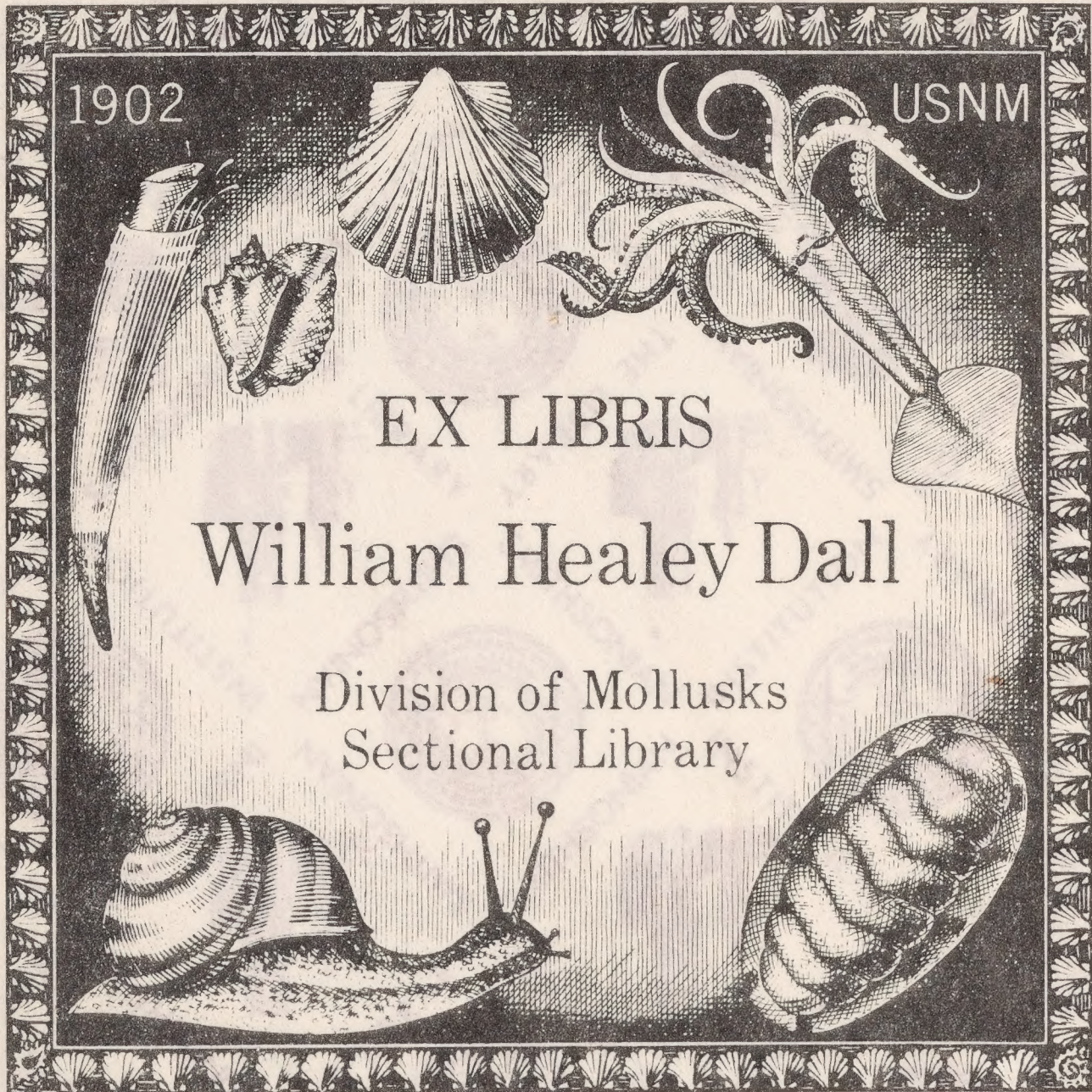
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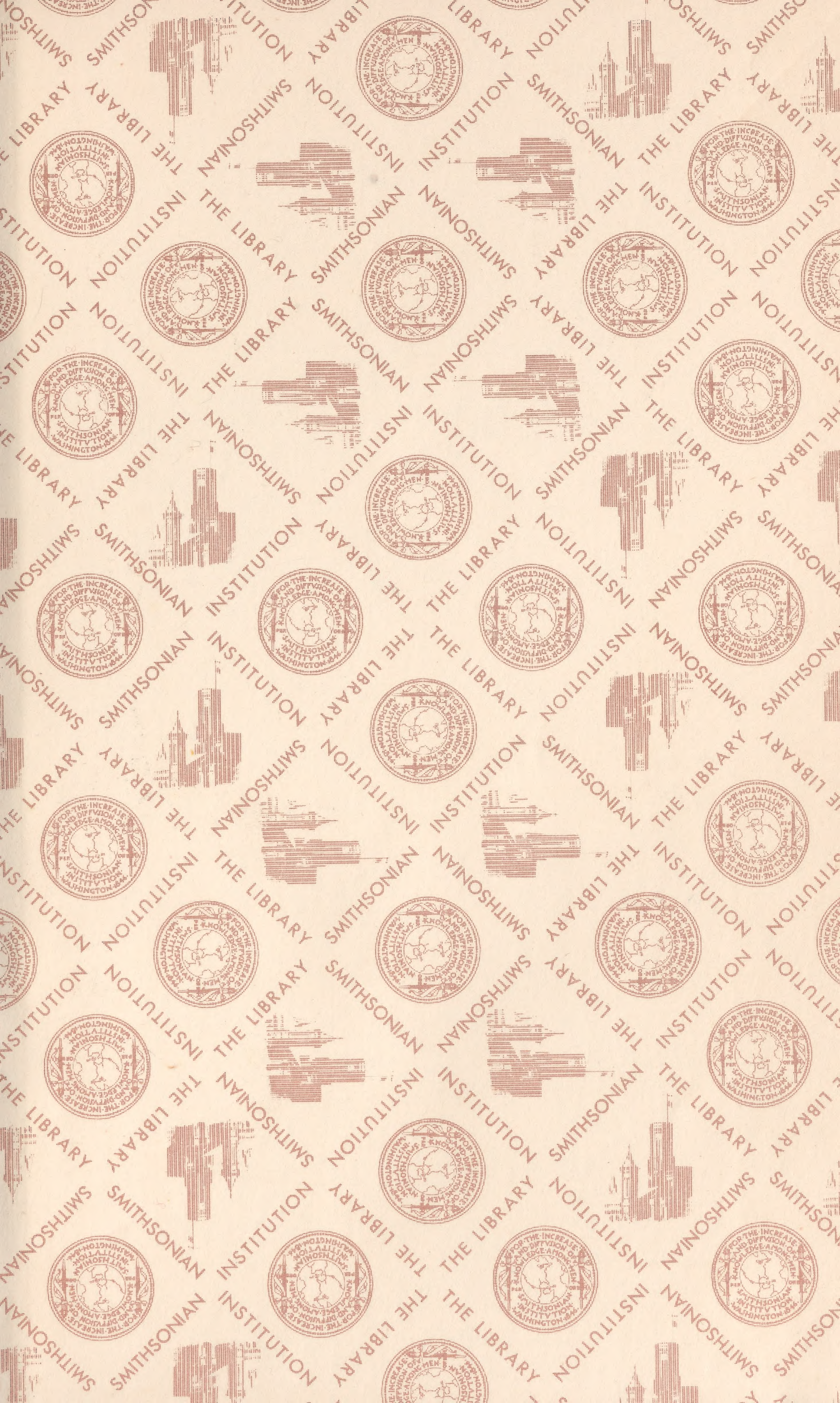
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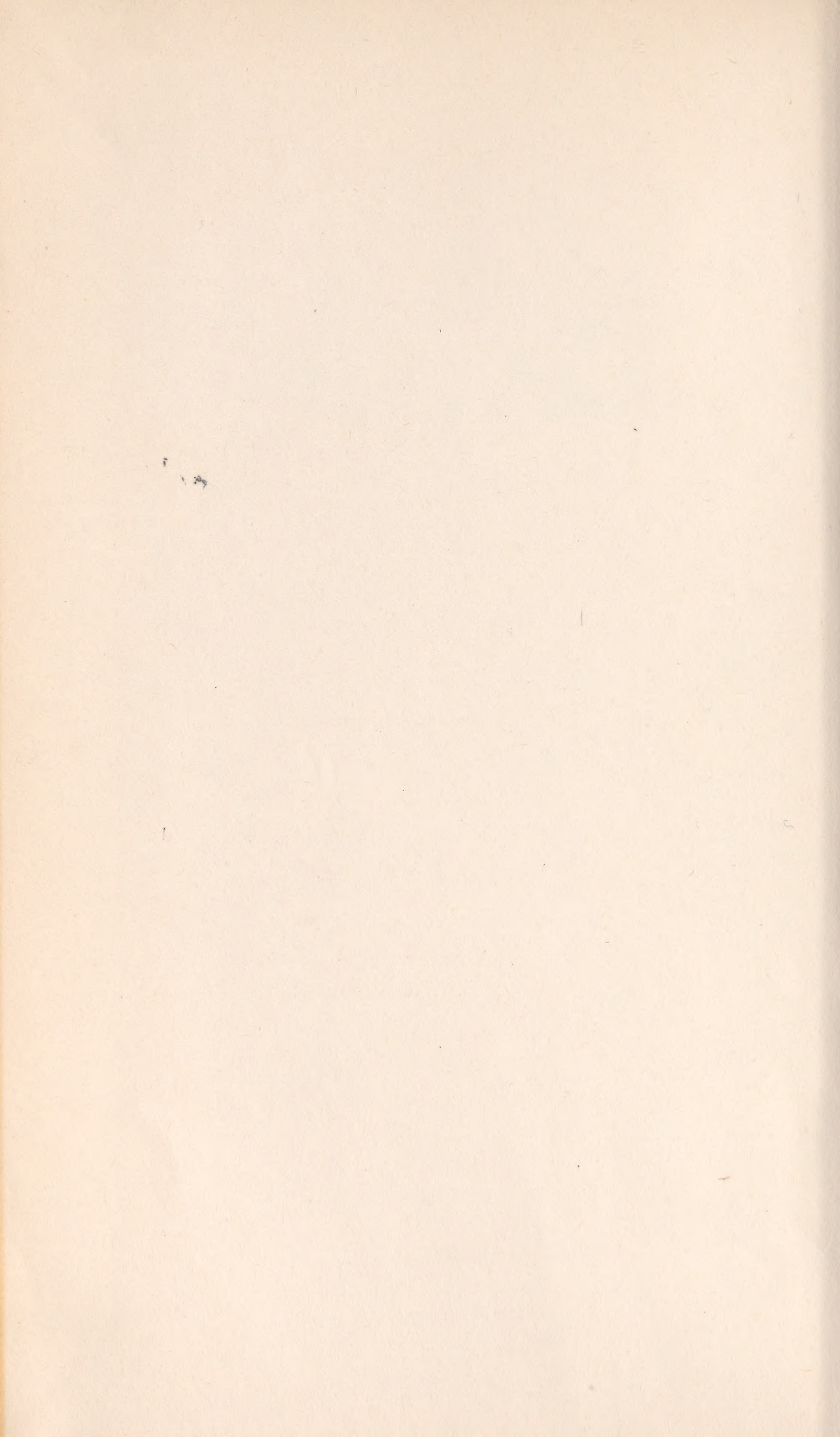
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THE
JOURNAL OF CONCHOLOGY
VOLUME 25

1961—1965

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SUBSCRIPTIONS became due on 1 January and Members who have not already done so are asked to remit to the Hon. Treasurer without further delay. Those who are in arrears by more than a year cannot expect to receive copies of the *Journal* until their subscription is paid. Members are reminded that the annual subscription is now £1. Please make certain that your remittance fully covers the subscription or the total amount due. The mounting cost of printing makes it essential that subscriptions should be promptly paid if the *Journal* is to be published at regular intervals. At present it is financially prohibitive to produce more than two numbers a year. Donations towards the cost of publication would, of course, be gratefully welcomed by the Hon. Treasurer.

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A REVISION OF THE FRESHWATER MUSSELS OF THE FAMILY ETHERIIDAE

By T. PAIN and F. R. WOODWARD

(Read before the Society, 15 October 1960)

ETHERIIDAE

THE Etheriidae are characterised by the irregular growth of the shell valves, one of which is normally fixed to the substrate in the genera *Etheria*, *Acostaea* and *Pseudomulleria*. The fourth genus *Bartlettia* remains free, but the anterior margin is produced into a characteristic outgrowth giving the shell a unique appearance.

The family is often referred to as "Freshwater Oysters," due to the close resemblance in external shell features to *Ostrea*. Essential differences, however, include the presence of a sinus, and in the genera *Etheria* and *Bartlettia* there are two muscle scars throughout life, compared with one in true *Ostrea*.

In *Acostaea* and *Pseudomulleria*, there are two scars in the juvenile stages only, the anterior of which atrophies in the adult giving rise to a monomyarian shell, as in *Ostrea*.

With the exception of *Etheria*, examples of the family are scarce in collections, and the authors would be grateful for any further information regarding distribution, life histories, etc., of this interesting group.

ACKNOWLEDGMENTS

The authors wish to express their thanks to the following institutions for the loan and examination of specimens. The British Museum (Natural History); Birmingham Museum and Art Gallery; Birmingham Natural History and Philosophical Society; Musée Royal de l'Afrique Centrale, Tervuren; National Museum of Wales, Cardiff; Nottingham Museum; Liverpool Museum. Also to Richard I. Johnson, L. Bilton, M. Goodchild, S. P. Dance, R. Dominguez, T. E. Crowley, H. de Sousa Lopes, Dr. Josae Carmengo Mendes, H. C. S. Halton and Mrs. N. F. McMillan for information, helpful criticism and advice. We are also indebted to Mrs. M. E. Bullock for her assistance in the preparation of the manuscript.

ETHERIA Lamarck.

Etheria Lamarck, 1807, *Ann. Mus. Nat. Hist. Paris*, **10**, 400. Type designated by Gray (1847, *Proc. Zool. Soc. Lond.* 193), *Etheria semilunata* Lamarck (= *E. elliptica* Lamarck).

Aetheria Berthold, 1827, in Latreille, *Natür. Fam. des Thierr.* 208, (emendation of *Etheria*).

Etheria Schweigger, 1820, *Handb. d. Naturgesch. der Skel. Ungeglied. Thiere.* 708 (*E. elliptica* Lamarck cited).

Aetheria group *Caillaudiana* Bourguignat, 1880-81, *Mater. Moll. Aceph. Syst. Europ.*, **1**, 63. Monotype *Aetheria caillaudi* Férussac.

Aetheria group *Nilotriciana* Bourguignat, 1880-81, *op. cit.* Type, designated by Pilsbry and Bequaert, 1927, *E. elliptica* Lamarck.

Aetheria group *Chambardiana* Bourguignat, 1880-81, *op. cit.* 69. Monotype *AE. chambardi* Bourguignat.

Aetheria group *Levourneaxiana* Bourguignat, 1880-81, *op. cit.* 69. Type designated by Pilsbry and Bequaert, 1927, *AE. petrettinii* Bourguignat.

The genus *Etheria* is confined to the Ethiopian Region and Madagascar, where *E. elliptica* has been taken in the Mazharavy and Androsty Rivers, north-western Madagascar.

Many supposed species have been defined, but Pilsbry and Bequaert (1927, 449) recognised all as forms of one very variable species, both smooth and spinose individuals appearing to occur together in some localities.

The soft parts and anatomy have been studied in much detail by Anthony (1907) and Sassi (1910).

***Etheria elliptica* Lamarck.**

Etheria elliptica Lamarck, 1807. *Ann. Mus. Hist. Nat. Paris*, **10**, 104, pl. 29, pl. 31, fig. 1. (Type locality not given).

Etheria elliptica Pilsbry and Bequaert, 1927. The aquatic Mollusca of the Belgian Congo. *Bull. Amer. Mus. Nat. Hist.* **53**, 449 (with full synonymy to 1927), pl. 46, figs. 1, 1a, pl. 30, figs. 2, 2a.

„ „ Darteville and Schwetz, 1948, Le lac Tanganyika. *Bull. Inst. R. Col. Belge.* **16**, 45, 51, 52, 61, 78.

Etheria elliptica Leloup, 1950. *Exploration Hydrobiologique du Lac Tanganyika*, Lamellibranches **3**, Fas. 1, 91.

The shells of this mussel are extremely irregular in form, and both smooth and spinous specimens are found. It can likewise attain considerable size (to over 20 cm.). After examination of a large series of specimens in the collection of the Tervuren Museum, we are of the opinion that Pilsbry and Bequaert (1927) were correct in considering that but one extremely polymorphic species of *Etheria* exists.

E. elliptica inhabits rocky and stony ground about rapids and falls of fair sized streams, where it forms banks, often of considerable extent. The Mollusca there attach themselves by one valve to the rock and also to other shells of their kind. They are regularly collected and used as an article of food by certain native tribes in the Congo.

DISTRIBUTION. Tropical Africa. The Nile system generally, Lake Victoria and its affluents, south eastward to the Warmi (or Vuami) River opposite Zanzibar; westwards through the Chari-Chad basin to that of the Niger and Senegal in West Africa, southwards to cover

the entire Congo basin and northern Angola, also in north-western Madagascar. Its occurrence in Lake Tanganyika is considered by Pilsbry and Bequaert (1927, 452) as very doubtful, with which opinion Leloup (1950, 92) agrees. There are no authentic records either for Lake Nyasa or the Zambesi river system. We have since seen authentic specimens from Lake Rukwa in Tanganyika Territory (B.M.N.H.). Verdcourt (1960, 263) records its occurrence in lacustrine deposits at Turkena, 34 miles north-east of Lodwar, Kenya.

BARTLETTIA Adams

Bartlettia Adams, 1866 (Type *Etheria stefanensis*).

Anodonta Lea, 1834. *Observations on the genus Unio*, 1, pl. 12, fig. 36.

Etheria Moricand, 1856. *J. Conchyl.* **5**, 178, 181, pl. 7, fig. 10.

Bartlettia Adams, 1866. *Proc. Zool. Soc. London*, 444, pl. 38, fig. 7.

Bartlettia Sowerby, 1872, *Conch. Icon.* 18 *Mulleria and Bartellettia*.

Rochanaia. De Morretes, 1941. *Arquivos do Instit. Biologico*, Sao Paulo, Brazil, **12**, Art. 5, 75-80, pl. 31-2.

Bartlettia stefanensis (Moricand)

Anodonta tenebricosa Lea, 1834. *Observations on the genus Unio*, **1**, pl. 12, fig. 36.

Etheria stefanensis Moricand, 1856. *Journal de Conchyliologie* **5**, 178-181.

Etheria stefanensis Adams & Adams, 1858. *Gen. rec. Moll.* **2**, 510.

Bartlettia stefanensis Adams, 1866, *Proc. Zool. Soc. London*, 444, pl. 38, fig. 7.

Bartellettia stefanensis Sowerby, 1872, *Conch. Icon.* 18, *Mulleria & Bartellettia*.

Bartlettia stefanensis Kobelt, 1878. *Illus. Conchylienbuch*, 362.

Bartlettia stefanensis Fischer, 1887. *Manuel de Conchyliologie*, 1007.

Bartlettia stefanensis Paetel, 1888. *Catalog.* **3**, 190.

Bartlettia stefanensis Thiele, 1934. *Handbuch d. system. Weichtierkunde*, **2**, 843.

Rochanaia gutmansi de Morretes, 1941. *Arquivos do Instit. Biologico.* **12**, Art. 5. 75-80, pl. 31-2.

Bartlettia gutmansi de Morretes, 1949. *Ensaio de Catalogo dos Moloscos do Brazil Arquivos do Museu Paranaense*, **8**, Art. 1, 25.

Bartlettia stefanensis was first described and figured by Moricand in 1856 under the name *Etheria stefanensis*. H. A. Adams in 1866 proposed a new genus *Bartlettia* for this species and figured it. This generic name was later spelled incorrectly by Sowerby (1872) as *Bartelettia*. L de Morretes (1941) described a new species of lamelli-branch from Brazil under the name *Rochanaia gutmansi*. His description is accompanied by two excellent plates (31 and 32) from photographs, which are indistinguishable from *Bartlettia stefanensis*.

(Moricand). In 1949 he referred *gutmansii* to the genus *Bartlettia*, but retained it as a separate species. The authors have so far failed to obtain samples of *B. gutmansii* and so have been unable to compare it with the type of *Bartlettia*, but feel confident of their synonymy after examination of the magnificent figures given by de Morretes.

On going through the d'Orbigny collection of South American freshwater mussels in the British Museum, the junior author came across specimens labelled *Anodonta tenebricosa* Lea. These afforded a series between *Bartlettia* with its irregular shell and a normal unionid shell. *A. tenebricosa* also resembles *Bartlettia* in that the nacre ceases about 3 mm. from the margins of the valve, in the greenish coloration of the corroded umbones, the sinus and the bluish-green nacre, which Lea himself stated to be distinct from any Unionid known to him (*Ob. genus Unio*, 5, 190). It is interesting to note that Alberto Carcelles (1940, 220; 1942, 13), in his papers on the occurrence of *Bartlettia* in Paraguay, states "Youngest specimens, similar to *Anodontites tenebricosus* (Lea)." It would seem, therefore, that *Bartlettia stefanensis* (Moricand) may prove to be an adult form of *Anodontites tenebricosa*, but this will remain in doubt until a large series of examples can be examined. A possible explanation for the deformation of the valves of adult *Bartlettia* is that it may be due to the nature of substrate upon which the species dwells, i.e., if rocky then typical *Bartlettia* arise, but if mud or sand then normal *Anodonta tenebricosa* develop.

DISTRIBUTION. *Bartlettia stefanensis* has been recorded from Ecuador, Huallaga River (Amazon drainage); Paraguay, Arrogo Guazu (A. Carcelles); Brazil, Perto de Nioaque, Est. de Mato Grosso (F. Lange de Morretes); Peru, Rio Huallaga, Todichie near Juangui, alt. 400 metres (J. Ortiz, Chicago Mus.); San Alezandra, 40 m. N.W. of Aqua Caliente, Huanaco (B. Kummel - M.C.Z., Harvard College; Pain Coll.).

ACOSTAEA d'Orbigny

Acostaea d'Orbigny, 1851. *Rev. et Mag. de Zool.* 59-60, 183-188.
(Type *Mulleria rivoli* Deshayes).

Mulleria Férussac, 1823. (Non Leach, 1814, nec Fleming, 1828).

Mulleria Deshayes, 1827, *Dict. classique d'Hist. nat.* 11, 296-297.

Acostaea d'Orbigny, 1851. *Rev. Mag. Zool.* 59-60, 183-188.

Mulleria (*Eumulleria*) Anthony, 1907, *Ann. Soc. Zool. Malac. Belgique*, 41.

Acostaea (*Acostaea*) Haas, 1934, in Thiele, *Handbuch d. system. Weichtierkunde*, 843.

Mulleria Férussac, 1823, has been quoted as a homonym of *Mülleria* Leach, 1814 [Crustacea]. However, Férussac, in his original description of the genus in 1823, did not designate a genotype, but mentioned *Etheria plumbea* Lamarck, thus it would appear that *Mulleria* Férussac is a synonym of *Etheria* Lamarck. *Acostaea* d'Orbigny there-

fore should still stand for this genus. In the opinion of the present authors this seems satisfactory, since so far as they could find, the first figure of this species is that of d'Orbigny, 1851.

In 1907 Anthony, in his monograph of the Etheriidae, proposed a revival of *Mulleria* Férussac and divided it into two subgenera, *Eumulleria* for the South American species and *Pseudomulleria* for the Indian species. The present authors are of the opinion that Anthony's subgenus *Pseudomulleria* should be elevated to generic rank, owing to the widely separated localities of these two subgenera.

The genus *Acostaea* is monotypic consisting of the single South American species.

***Acostaea rivoli* (Deshayes), 1827.**

Mulleria sp. cf. *Etheria plumbea* Férussac, 1823. *Mém. Soc. Hist. Nat. Paris*, **1**(a), 368, genus 4, *Mulleria*.

Mulleria rivoli Deshayes, 1827. *Dict. Classique d'Hist. nat.* **11**, 296-297 (15 Jan.).

Acostaea guadasana d'Orbigny, 1851. *Rev. Mag. Zool* (2) **3**, 60, 184, pl. 6.

Mulleria lobata Férussac of authors, e.g. Woodward, *Manual of the Mollusca*, editions 2, 3, 4.

Aetheria novogranatensis Schaufuss, 1865. *Sitzungs Ber. Naturw. Gesell. Isis. Dresden*, 10.

Acostaea gadaseana Anthony, 1907. *Ann. Soc. Zool. Malac. Belgique*, **41** (1906), 322-430, pl. 11-12.

This species is characterized by being (1) dimyarian in the juvenile stage and monomyarian in the adult, and (2) shell inequivalve, fixed, the fixed valve generally produced at the umbone into a spur-like projection.

DISTRIBUTION. Columbia, Rio Magdalena: British Museum (Nat. Hist.), Manchester Mus.; Nottingham Mus.; Liverpool Mus.; Pain Coll.; (all without more definite locality).

PSEUDOMULLERIA Anthony

Mulleria Smith, 1898. *Proc. Malac. Soc.* **3**, 87.

Mulleria (*Pseudomulleria*) Anthony, 1907. *Ann. Soc. Zool. Malac. Belgique*, **41**, (1906), 322-430, pls. 11-12. (Type *Mulleria dalyi* Smith).

Acostaea (*Pseudomulleria*) Haas, 1934, in Thiele, *Handbuch d. system. Weichterkunde*, 843.

The authors feel justified in elevating Anthony's subgenus to generic rank on the strength of the distribution of the subgenera, *Eumulleria* being confined to South America and *Pseudomulleria* to India, an area far removed from any other member of the Etheriidae.

Pseudomulleria dalyi (Smith)

Mulleria dalyi Smith, 1898. *Proc. Malac. Soc.* **3**, 14-16 (figures in text).

Mulleria dalyi Woodward, 1898, *Proc. Malac. Soc.* **3**, 87.

Mulleria (*Pseudomulleria*) *dalyi* Anthony, 1907. *Ann. Soc. Zool. Malac. Belgique*, **41** (1906), 322-430, pls. 11-12.

Acostaea (*Pseudomulleria*) *dalyi*, Haas, 1934, in Thiele, *Handbuch d. system. Weichtierkunde*, 843.

Shell irregular, tending to be inequivalve, fixed, fixed valve being largest. Valve of fixation may be either right or left. Embryonal valves when present occupy extremity of a spur-like projection of the beaks. Embryonal shell completely infilled by shelly material, as in *Acostaea rivoli* (Deshayes). Exterior coloration of shell rich deep brown to greenish-black. Periostracum fibrous, growth lines prominent, resulting in concentric raised ridges. Structure of valves consists of alternating calcareous and chitinous layers, resulting in a flaky appearance of the free valve.

Internally the shell is edentulous, the valves being united by means of a strongly developed, horny, fibrous ligament. Cicatrix distinct. Nacre exhibiting an iridescent mixture of white, bluish, greenish, olive and pinkish tints, whilst the margin of the valves is an olive brown, which is particularly noticeable in the free valve. Muscle scars: anterior adductor scar absent, posterior adductor scar well developed, exhibiting concentric ridging, situated below and well behind the centre of the animal. A small posterior retractor muscle is situated immediately above or anterior to the posterior adductor muscle, according to Martin F. Woodward (*Proc. Malac. Soc.* **3**, 88). Pallial muscle scars are also present anteriorly. The probable reason for this loss of the anterior adductor muscle is due to the fixation of the shell at an early stage.

Smith in his original description does not appear to have designated a holotype and his specimens, which are preserved in the British Museum (Natural History), bear a label denoting them to be syntypes. It has therefore fallen to the present authors to select a lectotype for Smith's species. In his description he gives the following measurements of a shell: length 65 mm., breadth 52 mm., diameter 20 mm. The measurements of the 3 specimens in the British Museum (Natural History), however, do not agree with Smith's specimens. The measurements are as follows:

Specimen A. Length 55 mm., breadth 41 mm., diameter 30 mm.

Specimen B. Length 58 mm., breadth 42 mm., diameter 18 mm.

Specimen C. Length 69 mm., breadth 48 mm., diameter 23 mm.

The exact whereabouts of Smith's specimen being unknown, the lectotype had to be selected from A, B, or C. Since specimen C is damaged, the authors consider it unsuitable. Specimen A has the majority of the characteristics of this species, hence has been chosen in preference to B.

The lectotype was figured by Smith in his original description of the species, being the upper two drawings showing the external appearance of the shell. Distribution. Southern India, Mysore Province, probably near Mudgeri in the Shadier district (H.M. Daly, B.M. (N.H.)). Type locality: Budra River (A. Bonnet-Fulton in Pain Coll.).

SUMMARY

The family Etheriidae consists of the four monotypic genera *Etheria* Lamarck, 1807, *Bartlettia* Adams, 1866, *Acostaea* d'Orbigny, 1851, and *Pseudomulleria* Anthony, 1907.

The four species in the family are *Etheria elliptica* Lamarck, inhabiting the rivers of Africa; *Bartlettia stefanensis* (Moricand) and *Acostaea rivoli* (Deshayes) from South America; and *Pseudomulleria dalyi* (Smith), inhabiting the rivers of India.

The authors elevate Anthony's subgenus *Pseudomulleria* to generic rank, since they feel the distribution of *Acostaea* and *Pseudomulleria* merits generic distinction.

Rochanaia gutmansi de Morretes, 1941, is considered synonymous with *Bartlettia stefanensis* (Moricand). It is of interest to note that *Rochanaia* also resembles *Acostaea* in that the beaks are produced into a talon and in the nature of the shell corrosion. It is thought probable that when sufficient material is available for study, *Bartlettia* and *Anodonta tenebricosa* Lea may prove to be terminal members of a polymorphic species.

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NOTES ON EAST AFRICAN ENIDAE

By B. VERDCOURT

(Read before the Society, 21 January 1961)

Rhachistia picturata (Morelet).

Buliminus picturatus Morelet, 1889, *J. Conchyl.* **37**, 3, pl. 1, f. 4.

Buliminus (*Rhachis*) *trichrous* von Martens, 1891, *Sitzb. deutsch. Ges. Nat. Freunde* **1891**, 16; *Deutsch Ost-Afrikas, Beschalte Weichthiere*, 70, pl. 3, f. 31 (1897).

I HAVE examined the type specimens of both these names, the first being at the British Museum (Nat. Hist.) and the latter at the Zoological Museum in Berlin; they are conspecific. The juveniles are keeled and the keel is still just perceptible in the adult. Most of the East African material I have examined does not have the same pattern as the types, but has in addition two dark brown bands on the base, one just below the periphery and the other around the umbilicus; the types have only transverse chevron-like markings. Fresh shells of this arboreal species are of a bright yellow ground colour with the apex pale orange-brown. The transverse marks are thick and very variable; the columella and peristome are usually purplish. The following material is preserved in the Coryndon Museum, save where otherwise stated.

KENYA : Coastal Province, Bamburi (collector not known); Kilifi (J. G. Williams); Vipingo, on forest trees, December 1953 (B. Verdcourt): the following notes were made on the animal: fore body grey-buff, paler grey behind, tentacular retractors black and showing through, tentacles themselves reddish-brown; Marenji Forest, near Mrima, on *Popowia* bushes, September 1957 (B. Verdcourt) (juveniles only); Diani Beach, May 1957 (N. L. H. Krauss 5838).

TANGANYIKA : Pangani District, Tongwe Mountain (Verdcourt CL); Bagamoyo District, Mbiki River, near Ruvu (J. Alexander): these specimens match the types of *trichrous*; Kissemu in Ukwere (type of *trichrous*, Zoological Museum, Berlin); Dar-es-Salaam (A. Loveridge in CM 1014, 1015): atypical form with very curved zigzag markings.

ZANZIBAR : South-east Jembiani, 5 miles South of Paje (Ostheimer *et al.* in Acad. Nat. Sci. Philadelphia 213086, duplicates in CM); north-east shore line at Kiwengwa, amongst sand and grass (Ostheimer *et al.* in Acad. Nat. Sci. Philad. 212513, duplicates in CM).

SOMALIA : Mogadishu (type of *picturatus*, Brit. Mus. (Nat. Hist.)).

In the type of *picturatus* the transverse markings are distinctly chevron-like, the angle being on the periphery and pointing to the left hand side. In the type of *trichrous* the transverse markings are straight or slightly undulate and cut straight across the periphery; in neither are there any spiral bands. The available material shows now that these two patterns are merely variants of one species.

Rhachistia rhodotaenia (von Martens). Verdcourt, 1960, *Rev. Zool. Bot. Afr.* **61**, 231.

Bulimus rhodotaenia von Martens, 1869, von der Decken's *Reisen* **3**, 59, pl. 2, f. 2.

Rhachis rorkorensis Kobelt, 1909, *Abhand, Senck. Naturf. Ges.* **32**; 17, pl. 4, f. 8.

In addition to the specimens I cited in the above paper, a record can be given which indicates the true habitat of the species, since a considerable amount of material was collected alive. Much of this material has a broad indigo band and matches exactly the figures given by Kobelt for his *rorkorensis*, which in my opinion is merely a colour form of *rhodotaenia* and not really worth sustaining even as a variety, since in the same population examples can be found varying to forms which are devoid of markings save for the very deep indigo tip, pinkish purple columella and a barely perceptible yellowish or reddish band below the suture.

KENYA: Machakos District, 166 miles from Mombasa on Nairobi road, near Mtito Andei, on *Commiphora* trees, in *Commiphora-Acacia* dry bushland, 18 April 1960, Polhill and Verdcourt 34 (dry and spirit material in Coryndon Museum). The following very worn shells are also preserved in the Coryndon Museum collections: near Garissa (Verdcourt); Voi (Alexander); Tsavo National Park, Mbulia Hill (Alexander).

The type specimen of *R. rhodotaenia* was examined in Berlin. It is a rather narrow, young specimen 14 mm. high and 8.8 mm. wide. The apex and columella are reddish; on the last whorl there is an obscure reddish band just below the suture and a narrow dark purple-brown band on the periphery; the area between is yellowish with transverse brownish bands. The specimen was collected by von der Decken in "Sansibar," an elastic locality covering much of the mainland in those days.

Rhachistia (?) gomezi (G. B. Sowerby III); Connolly, 1925, *Trans. Roy. Soc. S. Afr.* **12**, 163.

Buliminus (Rhachis) gomezi G. B. Sowerby III, 1889, *Proc. Zool. Soc. Lond.* **1889**, 580, pl. 56, f. 8.

This species was described from Usagara in Tanganyika and the specimens came from the da Costa collection. The type set is preserved in the British Museum (Nat. Hist.), where I examined it; the species looks suspiciously un-African in facies and I believe the locality may be an error. Although large and very striking in appearance no further material has ever turned up. A new description is given below.

The shell is 21 mm. high and 12 mm. wide. The apex is indigo or brown and there are 1-2 rows of chestnut spots on the upper whorls. There are two dark indigo bands on the body whorl with a

band of pale chestnut dots above them and also scattered indigo dots. The columella is pink, but brown outside. The aperture is rich brown inside with a dark spiral line.

Rhachidina mozambicensis (Pfeiffer); Connolly, 1939, *Ann. S. Afr. Mus.* **33**, 416, pl. 13, f. 6.

Buliminus (*Rhachis*) *fuelleborni* von Martens, 1901, *Nachrbl. Deutsch. malak. Ges.* 148-9.

I examined the type set of *R. fuelleborni* at Berlin. The apex is horn-coloured, the rest is white with widely spaced oblique orange-brown stripes and scattered purplish translucent spots; in some specimens there is a narrow spiral band and a "feathered" interrupted band below it. I am quite certain that they are only large forms of *mozambicensis* with longer spires and fewer brown stripes.

The identity of *Buliminus* (*Cerastus*) *arctistrius* Kobelt.

When enumerating the Buliminidae for Martini and Chemnitz *Conch. Cab.* (2nd edition), W. Kobelt took up a manuscript name of E. von Martens for a species found in the 'Massai Steppe,' Mandaleo Gebirg (not traceable), Tanganyika. The size is given as 23 × 12.5 mm. with an aperture 10 mm. high. This name, which I had first obtained from the Zoological Record, had puzzled me since no true *Cerastus* known from Tanganyika fitted the description. During a recent visit to the Zoological Museum in East Berlin I therefore made a special search for the type of this species. A glance at it revealed it to be a *Pseudoglessula* allied to *P. boivini* (Morelet), but with the columella much more reflected and the sides of the spire more concave. The type measures 22.5 × 11.5 mm. It appears to be inseparable from *P. kirkii* (Dohrn).

Pseudoglessula kirkii (Dohrn); Connolly, 1925, *Trans. Roy. Soc. S. Afr.* **12**, 170.

Buliminus (*Cerastus*) *arctistrius* Kobelt, 1902, Martini and Chemnitz, *Conchyl. Cab.* (2nd ed.), 'Buliminidae' 891.

Buliminus kirkii Dohrn, 1865, *Proc. Zool. Soc. Lond.* **1865**, 232.

Other lots in the Berlin Museum which match the types are "Usamdawi, Mitteland, D.O.A., leg. H. Fliegner" (this had actually been determined as *kirkii*) and Kisemo, leg. Emin Pascha and Stuhlmann.

The problem of *Rhachistia histrio* (Pfeiffer).

Dr. A. Solem (1959, Systematics and zoogeography of the land and fresh-water Mollusca of the New Hebrides. *Fieldiana: Zoology* **43**, p. 60) has suggested that *Rhachistia histrio* (Pfeiffer), widespread in the New Hebrides, was in actual fact originally introduced from Africa. There is a good deal of evidence to support this theory. The African species of the genera allied to *Rachis* need revision; too many species have been described, but without more material the necessary

synonymies are difficult to prove. I strongly suspect that *R. histrio* (Pfeiffer) is in fact the common East African species *Rhachidina braunsi* (von Martens); Pfeiffer's name is much the earlier. The fact that the two species have been referred to different genera is not important.

The following account of the variation found in *R. braunsi* has been compiled from notes made on the authentic material studied in Berlin. The type lot show faint spiral striae and a variety of patterns of brown marks on a white ground :

- 1) two dark lines with two lines of dots above which coalesce in pairs vertically (typical);
- 2) two to three dark lines only or four in var. *quadricingulata* (von Martens);
- 3) two dark lines with spots above and below the peripheral one actually in contact with the line;
- 4) two dark lines with four lines of dots above the upper one, the first and third row below suture paler than the rest;
- 5) four dark lines and three lines of dots arranged alternately starting and finishing with an uninterrupted line, the first and third below the suture paler than the rest;
- 6) Var. *hyposticta* (von Martens). Shell with dark apex and horn-coloured whorls just below apex. Pattern of two lines of purplish elongated dots on a white ground, the upper line on the periphery; this pattern is repeated on the spire whorls.

Var. *succincta* is also exceedingly variable and usually slightly more slender than typical *braunsi*; the apex is black :

- 1) pure white;
- 2) white with one band;
- 3) two lines of dark dots;
- 4) upper wide band demarcated with dark lines containing transverse chestnut stripes; there is a similar band of stripes around the umbilicus, the bands being separated by a pale peripheral area;
- 5) a single subperipheral line and a narrow band of transverse stripes so that pattern is as follows below the suture : pale band, band of stripes, pale band, dark line, pale base;
- 6) similar to 4), but upper band of stripes has two lines inside it parallel to the upper and lower demarcating lines;
- 7) from suture downwards a band of feeble transverse brown stripes with two chestnut lines inside parallel to the thick dark basal demarcating line (peripheral line), lower part of whorl white save for single chestnut subperipheral line;
- 8) a dark peripheral line with three lines of pale chestnut dots above it, the upper line of vertically extended dots the other two of horizontally extended dots.

The specimen depicted on plate 13, fig. 5 of Solem's work is not obviously conspecific with the strongly keeled juvenile figured on plate 8, fig. 9, which is actually the holotype of *Rhachistia histrio* (Pfeiffer). Dr. Solem at my request sent me a splendid lot of material in spirit collected as follows: "Loyalty Islands, La Roche, Mare, Bory's Malkin, 7-8.X.58, on foliage." The shells in this lot are extraordinarily variable in pattern; the largest are 16 mm. high and 9 mm. wide. The ground colour is pale creamy buff ('biscuit'); the apical whorl is very dark brown followed by a whorl of pale brown. The following patterns are present:

- 1) No pattern at all or at the most an almost obsolete peripheral band;
- 2) A single dark brown peripheral band and a fine line just above the suture;
- 3) A further line of elongated brown marks just above the peripheral band, but few if any marks on spire;
- 4) A second band below the peripheral band and one or two interrupted or more or less interrupted pale brown bands above it just below the suture; these continue on to the spire;
- 5) The most developed pattern is as in 4), with the addition of a paler brown interrupted line half-way between the two basal lines and the two upper lines, there being five altogether; on the spire each whorl has three bands, a central band of dark elongate marks with a top and bottom band of small paler brown coalescent spots.

In many cases the dark brown uninterrupted lines appear as if they overlay a row of dark marks, and here the edges are uneven and the density of colouring irregular. There are very fine very close spiral striae cutting the fine growth lines, but the surface appears smooth and shining. The columella is not coloured.

This lot matches specimens of the very variable *Rhachidina braunsi* (von Martens), which is common in a multitude of colour forms on the East African coast. The specimen figured on Solem's plate 13, f. 5, is a close match of the type of *R. braunsi* var. *quadricingulata* (von Martens). I had already, whilst working in Berlin, noticed that this was close to '*Rachis*' *zonulatus* (Pfeiffer) from the Philippines, in size, sculpture and pattern, and Solem notes that the latter is similar to *R. histrio*. Several problems remain, however, before synonymy between all these can be absolutely proved. Connolly's figure of *Edouardia meridionalis* (Pfeiffer) is strikingly like a unifasciate *R. braunsi*, yet he does not hint at any relationship and maintains it in a genus in which it seems out of place. *R. dubiosa* Sturany is, I think, only a synonym of *R. braunsi*. I have a juvenile specimen from the Lugela District of Portuguese East Africa, Mocuba, Nama-goa, found on a plant specimen collected by Mrs. Faulkner. I have found nothing which exactly matches the juvenile type of *R. histrio* (Pfeiffer) figured by Solem. It could easily be a colour form of

braunsi but the exact pattern has not been observed in African material. An initial introduction of an African species into a remote area would undoubtedly be by means of a very small population and new patterns could very easily develop.

'Rhachis' moluensis Kobelt, 1909, *Abhand, Senck. Naturf. Ges.* **32**, 17, pl. 4, f. 10.

Specimens which closely match the figures and authentic material of this species have been found in East Africa.

KENYA. Voi, Duharu Hill (*leg.* J. Alexander); Taru Desert (in British Museum).

R. ganalensis Kobelt is probably a synonym of *moluensis*.

R. elongatulus (Bourguignat) is probably merely an elongated form, connected with the typical form through *R. erlangeri* Kobelt, which is I am sure only a form of *moluensis* Kobelt. I believe *R. hildebrandti* von Martens will prove to be the earliest name for this group, but a great deal more fresh material showing variation is required. Only dead shells are usually found. The species will be found on *Commiphora* and other stunted trees of the African bush during the rainy season.

AGRIOLIMAX AGRESTIS (L.) IN THE OUTER HEBRIDES

By D. HEPPELL

(*Read before the Society, 15 October 1960*)

THE true *Agriolimax agrestis* (L.), as distinct from *A. reticulatus* (Müller), was first recorded from the British Isles in 1941 (*J. Conch.* **21**, 238) from Surlingham, Norfolk, and was subsequently found in other parts of the Broads district (*Trans. Norf. & Norw. Nat. Soc.* **16**, 388), in fen and reed-swamp. In July 1933 A. R. Waterston sent immature specimens collected on small islands near Clachan, North Uist, to Hugh Watson, who considered that they probably belonged to this species.

On 17 August 1960 I collected three specimens of an *Agriolimax* from under stones in a roadside ditch at Scarista on the Isle of Harris, Outer Hebrides. As these were uniformly pale buff in colour, unlike the typically pigmented *A. reticulatus* which I had taken elsewhere on the island, I sent a specimen to Dr. H. E. Quick, who identified it as genuine *A. agrestis* (L.).

In contrast to the acid peat-moor of the east side of Harris, where the only land Mollusca I found outside of gardens were *Arion ater ater* (L.) and *Limax (Lehmannia) marginatus* (Müller), the soil at Scarista is very fertile, being neutralized by calcareous shell-sand from the Atlantic coast, and the land Mollusca there are numerous. In the same ditch with *A. agrestis* were living the following species: *Cochlicopa lubrica* (Müller), *Helicella itala* (L.), *Cochlicella acuta* (Müller), *Arion circumscriptus* Johnston, *Oxychilus cellarius* (Müller), *Retinella nitidula* (Draparnaud) and *Milax gagates* (Draparnaud).

THEBA PISANA (MÜLLER) IN GUERNSEY

By T. E. CROWLEY

(Read before the Society, 19 November 1960)

THIS species is sometimes regarded as an introduction into the mainland of Great Britain, although details of how this may have occurred are unknown. It appears possible, however, that it was originally introduced from Jersey, which is an ancient locality for the species. On the other hand, it was not recorded from Guernsey by any of the old-time authors, and F. C. Lukis, who first systematically listed the fauna of that island, does not mention it.

Sherriff Tye (1877), however, reported finding *T. pisana* "in many thousands" in Vazon Bay, on the west coast of Guernsey in May of that year, which he believed was the first record of that species on the island. This note brought response from Richard Rimmer (1877), who had found the snail at Vale Castle, St. Sampson's, in 1873. He assumed it was a recent introduction, as all the specimens found were adult; he expected that at the time of writing the colony would have perished, being as it was, situated on a north-easterly aspect. He had had opportunity to search the whole island for *T. pisana* in 1873 and, except at Vale, had found none, either at Vazon or elsewhere.

A. H. Cooke and H. M. Gwatkin, again in 1877, went farther. They were engaged in listing the molluscan fauna of Guernsey and found *T. pisana* at Vazon, "abundant and decidedly large," in September of that year. They took the view that the most likely introducer of the snail, although he had made no written reference to the fact, was Dr. F. C. Lukis, who had died in 1871. Accordingly they wrote to his daughter, who was able to confirm that he had in fact introduced the snail from Jersey in 1860, creating colonies at Vazon Bay, on the slopes of Vale Castle and just north of the village of Bordeaux.

E. D. Marquand (1894) confirmed that the snail flourished at all three localities, especially at Vazon, where it was in the "greatest profusion" and averaged 19 mm. in size, the largest specimen being 21 mm. A larger form occurred at Bordeaux and variety *alba* Shuttleworth both there and at Vale Castle.

Tomlin (1925) reported that the Bordeaux habitat had been destroyed by tipping and that "an albino form with translucent bands" was found among the Vazon colony, though Sherriff Tye had particularly noticed that no whitish shelled or albino examples were to be seen there.

During a recent stay in Guernsey, I was able to visit both the Vazon and the Vale Castle localities. In the former case the snail was reported as living "Behind the sea wall," but it is evident that this locality no longer exists, since the sea wall has been rebuilt and

raised after the last war and the strip of ground between there and the coastal road has been paved, to provide grandstand accommodation for spectators when motor-cycle racing is organised on the sands below. The alteration contract evidently included the construction of a three foot high dry stone wall along the coastal road on its landward side, and *T. pisana* was to be found in the lee of this wall on waste ground, mostly clinging to stems of marram grass, sea-radish (*Raphanus maritimus*)—which it is supposed to favour—samphire (*Crithmum maritimum*), and a dock (*Rumex conglomeratus*). The sea-pink (*Armeria maritima*) mentioned by Sherriff Tye is not now to be found in the immediate vicinity. On the occasions of the two visits made, 13 and 18 July, 1960, the prevailing south-west wind was blowing strongly and the snails were all aestivating. They could be found only in the actual lee of the low wall, only one or two specimens being picked up in a dying condition four to six feet away from it. Although dead shells of companion species, *Helicella virgata* and *Cochlicella acuta*, with a few *Oxychilus cellarius* and *Helix aspersa* (mostly var. *minor* Picard), were so common as to form drifts in the hollows of the ground, shells of *T. pisana* were almost entirely lacking anywhere in the vicinity. The habit of this snail is frequently to bury itself, and possibly it will do this if conditions are not to its liking or if it is sickly. This might account for the rarity of dead shells. The translucent-banded or ivory coloured forms of the variety *alba* Shuttleworth were occasionally to be found, and it was also noticeable that nearly all shells were in the process of growth, with fragile newly-formed lips. No shell found measured over 18 mm. in diameter.

Theba pisana no longer lives at Vazon in "countless thousands," and an afternoon's search is now needed for two or three dozen specimens. It could be found only in places directly sheltered from the south-west, and it seems probable that the reconstruction of the sea wall has seriously affected its numbers.

At Vale Castle, visited 18 July, the hill slopes steeply down north-eastwards from the old ramparts to the coastal road, and a prolonged search yielded only fragments of two dead shells, sufficient perhaps to prove that the species retains a foothold in this area. It can never have been so thriving a colony as at Vazon, owing to the less hospitable north-eastern aspect of the site which, however, does give shelter from the prevailing wind. This was blowing hard with a strong drying effect during the visit, and no doubt the snails had buried themselves in protest at uncongenial conditions. Associated species were the same as those at Vazon, with the addition of *Ashfordia granulata* (Alder), and the vegetation was similar but also included pellitory (*Parietaria diffusa*), brambles, nettles and bracken.

In compiling this note my thanks are due to Miss M. de Sausmarez and Mr. Nigel Jee for their assistance with botanical identifications and local advice.

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F. C. LUKIS AND THE TRITON

By T. E. CROWLEY

(Read before the Society, 19 November 1960)

It was Frederick Corbin Lukis (1788 - 1871) who first investigated on a scientific basis the archaeology of Guernsey, of which island he was a native. Lukis was also a conchologist of note and did considerable systematic work on the local fauna; in particular he compiled the first list of Guernsey Mollusca, and introduced several species of snail to the Island. The written results of his labours nearly all lie unpublished in a massive work of eight volumes, but a museum was organised in St. Peter Port to house the large archaeological and zoological collections which he made throughout an active life, and this establishment is now known as the Lukis and Island Museum. It contains a collection of the local marine and non-marine Mollusca, some of them possibly assembled by Lukis, but all at present in poor condition.

During a recent visit to Guernsey I was interested to inspect an old shell collection in an unusually fine Victorian cabinet, acquired by Mr. V. E. Blad. This had been purchased in 1926 at an auction of the effects of the late Colonel Le Motte of St. Peter Port. The cabinet, finely constructed of rosewood, measures 24 × 18 inches, standing 30 inches from the floor, and contains twenty four specimen drawers with two side drawers; the top is beautifully inlaid as a chess-board.

The shell collection contained in the cabinet consists of about three thousand specimens; it is evidently well over a century old, certain dated shells having been labelled as early as 1832 and, besides containing many British, Jersey, Shetland and some foreign shells, appeared to include a practically complete assembly of the marine and non-marine Mollusca of Guernsey. All shells were mounted on tablets in the style used many years ago at the British Museum, carefully labelled below in brown ink, labels of Guernsey specimens being invariably endorsed 'Sarnia.'

The shells, though somewhat neglected, seem to have suffered little on the whole, owing to the drawers having been fitted with glass covers. In view of the age and completeness of the collection, it appeared that it might have been assembled by Lukis himself, and a comparison of the handwriting on the labels with that on various documents in the Museum confirmed that this had indeed been Lukis's private collection. Colonel Le Motte married a Miss Lukis.

It was noted that the collection contained no specimen of *Charonia lampas* (Linné), although F. C. Lukis is on record as the first discoverer of this species in British waters. J. G. Jeffreys (1858) reported that three specimens of "this truly magnificent shell" had been taken off the Guernsey coast between 1825 and 1847, two of them being in "the celebrated collection of Guernsey shells collected by Mr. Lukis." He goes on to quote the latter as saying: "On August the 25th 1825 the largest one was brought to me by one of our Island fishermen, Charles Ozanne of Paradis, Vale Parish. He had a few days previously dredged it alive, and in order to extract the fish, had boiled the shell. Some years after, a second was dredged by another fisherman, and was also alive. This was obtained in a living state by the late Admiral Sir Thomas Mansell. In the year 1847 a third specimen was brought to me alive and I kept it in seawater for a fortnight. It was very active and crawled out of its bucket on to the floor."

Jeffreys continues to say that the largest specimen—presumably he means the Ozanne shell—measured nearly nine inches in length, though the tip had been broken off since it was taken. He describes this specimen as partly encrusted with a growth of *Lepralia coccinea* which is found only as far south as the British Isles. He had examined all the specimens, and Lukis had presented him with one of them, and this statement arouses a suspicion that in writing of the affair Jeffreys was relying too much on his memory. He has already stated that two specimens are *now* in Lukis's possession, one with Mansell and one given to himself, so that the question arises whether there were not four shells found instead of three as reported.

Nine years later Jeffreys (1867) says of *Triton nodiferus* Lamarck [= *Charonia lampas* (Linné)]: "Habitat: Guernsey Coast, where three living specimens were trawled at different times between 1825 and 1832. Two were procured by Mr. Lukis (who kindly presented one of them to me), and the third by Sir Thomas Mansell: the largest was taken near the Caskets, by James Ozanne of Paradis Vale on the 25th of August 1825 I was assured both by him and Mr. Gallienne that the Guernsey fishermen trawl only within a short distance from their own land, and never go on the opposite coast of France, and that French trawlers never come to the Channel Isles."

If this later and therefore presumably reconsidered statement is to be believed, the shell found in 1847—which he forgot to mention—must have been not the third but the fourth, and it was in fact this one which was given to Jeffreys himself. That he cannot always be relied upon in details may be deduced from his inaccuracy in the name of the fisherman Ozanne; and he appears to have forgotten the discovery of his own shell.

Much written discussion followed Jeffreys' original article of 1858. Hanley believed that the Tritons must have come from Spain, while William Clarke (1859) said "Those who believe this to be a British

species have much more faith than I can lay claim to." However, Jeffreys seems to have carried his point.

I can find no record of any other specimens of this shell having been found since, although several examples of the related *Cymatium cutaceum* were found by Lukis and others, a dead shell having been dredged off the Little Russel as recently as 1932.

Sowerby (1859) illustrates one example of each species with the following captions:

- "1. *Triton cutaceus* Linn. Channel Isles. Rare as British. Mr. Lukis's specimen, taken living off Guernsey.
2. *Triton nodiferus* Lam. Guernsey. Three living specimens, one encrusted with *Lepralia coccinea*: (truly British). Mr. Jeffreys' specimen, reduced."

After his death, Jeffreys' collection was acquired by the Smithsonian Institution in Washington, and Dr. Rehder, the Curator of Mollusca, confirms that it contains a specimen of *Charonia lampas* labelled 'Guernsey, alive 1847' (U.S.N.M. 193284). This certainly accounts for one specimen.

Tomlin (1944) noted that Marshall told him, presumably many years before, that one *T. nodiferus* (= *C. lampas*) was still in the Lukis collection, and had always been jealously guarded as if of priceless value. It descended to the owner's son, who stored it in a lumber cellar. On his death the whole collection was put up for auction, but was rescued by Mrs. Le Motte, who was a daughter of F. C. Lukis. Tomlin continues to say that Lukis's house was later converted into a museum, the curator of which, Col. de Guerin, took him on one occasion to a basement room and showed him a Triton which was, in his opinion, undoubtedly the shell to which Marshall had referred. It was unlabelled and the curator promised to have it properly labelled and cared for.

The Lukis and Island Museum is no longer housed in the old Lukis home, but in a much larger building at the top of the town. It seemed possible however, that some of these historic shells might again be located, and I wrote to Mr. and Mrs. Blad asking them to obtain permission to search the store rooms of the present Museum. On 5 October 1960 Mrs. Blad informed me by letter that she and her daughter had been able to locate three specimens of *C. lampas* in an attic. One, unlabelled, over ten inches long, was encrusted with a polyzoan, which seems in accordance with Sowerby's description. The second had a broken tip, but would otherwise have measured over eight inches in height. Inside this was a very faded label which read 'J. Ozanne. Dredged up off the Casquets 1825.' This specimen, in otherwise good condition, answers to the description of the one first recorded by Lukis. The third shell found, nine inches long and in perfect condition, also bore a label in the same handwriting as the first, deduced to be that of Col. de Guerin, reading 'Found alive off Guernsey,' without further details.

It now seems evident that the shell with the broken spire, contrary to Jeffreys' statement, was not that encrusted with *L. coccinea*, nor was it the largest found. These two shells seem to have been merged in Jeffrey's mind, and Sowerby repeated the error. Unless the labelling has been badly mixed (which is possible, although there is no evidence of it), one may perhaps deduce that the Ozanne shell and the encrusted shell belonged to Lukis, while the nine-inch specimen labelled by de Guerin was probably the one which had belonged to Mansell.

My sincere thanks are due to Dr. Harald A. Rehder for information sent and to Mr. A. E. Ellis for references and helpful advice.

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EXPLANATION OF PLATE 1.

Charonia lampas (L.), Guernsey, in the J. G. Jeffreys collection at the Smithsonian Institution, Washington. Dimensions: 135.55 x 72.9 mm.
 (Photo by courtesy of Smithsonian Institution).

FIRST EUROPEAN MALACOLOGICAL CONGRESS

(Under the auspices of a Committee appointed by the Conchological Society of Great Britain and Ireland and The Malacological Society of London.)

LONDON. 17 to 21 September 1962.

OBJECT. To discuss all aspects of European Malacology and the formation of a European Malacological Union. The Congress is, however, open to all interested in Malacology from any part of the world.

PROGRAMME. This will include Scientific Meetings and Field Meetings.

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CHARONIA LAMPAS (L.)

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THE NATURALIZATION IN EUROPE OF THE QUAHOG, *MERCENARIA MERCENARIA* (L.)

By D. HEPPELL

(Read before the Society, 15 October 1960)

IN the summer of 1956 a colony of live quahogs was discovered at Gosport, Hampshire. My investigations to discover their origin uncovered a considerable amount of information relating to the occurrence in Europe and to the conditions necessary for the successful naturalization of this American species, the substance of which is contained in this paper.

INTRODUCTION

The quahog, or hard-shell clam, *Mercenaria mercenaria* (L.), is abundant along the entire Atlantic sea-board of North America, having a continuous range from Texas to Cape Cod, with isolated relict populations as far north as the Gulf of St. Lawrence (Turner, 1953). Great quantities of these clams are consumed annually either raw, the young "little-neck" or "cherrystone" clams being reckoned as great a delicacy as the oyster *Ostrea* (*Crassostrea*) *virginica* Gmelin, or made into a chowder. Unlike the oyster, the quahog is eaten at all seasons of the year for, whereas the meat content of both species is influenced by the spawning periods, the presence of the muscular foot keeps the volume of meat in the clam at a higher level.

Although the quahog has long been known as *Venus mercenaria* L., and is still usually found under that name in the literature, *Mercenaria* Schumacher, characterized by the complete absence of any anterior lateral hinge tooth, has more recently been elevated to generic status, as the number and position of the hinge teeth are of primary taxonomic importance within the family Veneridae. As *V. verrucosa* L. has been fixed as the type species for *Venus* L., Schumacher's name can be used for the present species, which becomes the type species of the genus *Mercenaria* (Wells, 1957).

The name *quahog* is derived from the Narragansett Indian *poquaûhock*, the species being well known to the American Indians, who employed it not only as an article of diet but also as the main source of wampum. The terms *clam* and *quahog* are applied to a variety of commercial molluscs. To avoid confusion in the literature, Turner (1953) lists the popular synonymy of the American species.

Because of the economic value of this mollusc, attempts have been made from time to time to introduce the quahog into England and France. For various reasons almost all these attempts have failed; on the other hand, the species has appeared in places where there is no history of attempted introduction. The reasons for the failure of some introduced colonies and the possible sources of origin of the others will be discussed below.

OCCURRENCE IN BRITAIN

The first recorded finding of *M. mercenaria* in Britain was at Bootle, the specimen being exhibited by Higgins at a meeting of the Literary and Philosophical Society of Liverpool in 1859. Only the empty shell was found and its origin was thought to be ballast. In 1864, however, the species was found to be living in the Humber. It was seen there again in 1868 and must have increased its numbers considerably by 1889, when the Manchester City News of 23 March reported the species as "bidding fair to compete with the familiar cockle" (Marshall, 1897). A series of specimens dredged alive from the Humber was exhibited at a Manchester meeting of the Conchological Society in that month, and Petch records that specimens were still being obtained in 1907 by the Cleethorpes oyster dredgers. Since then, however, there has been no mention of the Humber quahogs, and we may presume the colony to be extinct.

In 1869 an attempt was made to naturalize *M. mercenaria* in the Liverpool district by Moore, who had received a supply of live clams that February from a Captain Mortimer, Commander of the ship *America*. Of these imported clams, some were sent to Buckland to be laid in his enclosure at Reculver, in Kent; of the others, some were cast into the sea at Southport, some at the Great Burbo Bank at the mouth of the Mersey and the remainder at Crosby. Unhappily, despite a long and careful look-out for results, none were forthcoming beyond the rumoured finding of a doubtful valve (Moore, 1886). Captain Mortimer, for his keen interest in Marine Zoology, was elected the first Associate Member of the Liverpool Literary and Philosophical Society. To celebrate this event he invited Moore and other members of the Society to a dinner of several courses on board his ship, the whole of the animal food of which consisted of clams: Clam soup, Clam cutlets and clams served in many other ways.

On Wednesday, 27 September 1882, Shrubsole visited Hilbre Island, in the estuary of the Dee, with the purpose of collecting natural history objects for a meeting of the Chester Society of Natural Science. Among the objects he collected that day, on the beach looking north-west opposite the sandbanks, were over a hundred specimens of either one or both valves of a shell unknown to him. On enquiry, he discovered them to be specimens of *M. mercenaria*, and that a barrel of the same had been laid down for storage purposes in the shallows around the Island by a Mr. Brandreth in December 1879. Shrubsole (1885) reports that the condition of these shells when found was fresh, so fresh that the ligaments were still perfect, showing that the clams must have been living within a week or so of his visit. Moreover, from their size, he considered some of his specimens to be only a few months old.

The reason for the failure of these colonies was thought to be in regarding the quahog as a marine species, rather than as an inhabitant of brackish water. Consequently in 1883 Moore made his second

attempt at naturalizing *M. mercenaria* in the more brackish waters of the Dee. Again Captain Mortimer sent a barrel of living clams from New York to the Liverpool Museum for this introduction. These were divided among Moore, Shrubsole and Walker, who distributed them in the following situations:—

Moore: into the stream beyond the bridge above the Great Float,
 or Birkenhead line of docks;
 into the Dee near Queen's Ferry at low water.

Shrubsole: between the White House, in the upper waters of the
 Dee, and Connah's Quay.

Walker: the flushing-pool at Bagillt Wharf;
 at the point where the channel leading to Bagillt enters
 the main channel of the Dee, about one mile from the
 shore;
 the Voryd, where the Chester and Holyhead railway line
 crosses it at Rhyl (i.e. the Clwyd estuary);
 the shore between Colwyn Bay station and Eirias Dingle.

Walker (1894) states that the flushing-pool was cleaned out to a depth of two feet of mud in 1888, but no trace of the clams was found. Nor was there any evidence of successful colonization at any of the other stations. A few of the clams, which had been placed in the Liverpool Museum Aquaria, were still alive at least sixteen months later, notwithstanding the extremely limited accommodation afforded by the small glass vessels in which they were kept, indicating that the molluscs were in a healthy condition on arrival (Moore, 1884).

In the 1920's shells of *M. mercenaria* were found on ground formerly used for the laying of American oysters in the Menai Straits at Caernarvon. There is no evidence of breeding having occurred there. I am informed (*in litt.* 14.vii.1960) by Mr. C. C. Jefferies, Managing Director of Musson & Co., the main importers of American oysters up to the second world war, that though they imported no clams as such into this country, one or two were occasionally found on the top of barrels of oysters as samples. *M. mercenaria* may have been introduced in this way to the beds at Caernarvon and possibly also to those at Brightlingsea, Essex. The former have been in disuse for nearly forty years.

In recent years several quahog colonies have been discovered in the Solent area. A colony of several dozen individuals at Lee-on-the-Solent was first found in the summer of 1956. Since then three colonies have been noticed in Southampton Water, at Marchwood (1958), Weston, and Hamble Spit (1959), and in 1960 a single specimen was taken in Stokes Bay. Before considering these recent occurrences in detail, the history of the quahog in France will be reviewed.

FRENCH INTRODUCTIONS

In France, an experimental introduction of *M. mercenaria* was attempted by Coste as early as 1861, and again in 1863 (Fischer, 1865). The situation chosen for both attempts was the north-east part of the Ile aux Oiseaux, in the Arcachon basin. Both consignments were received in excellent condition, and when Fischer visited the colony early in 1864 he was able to report that those clams laid down in 1861 had increased in size by about 2 cm., and those of the 1863 introduction by several millimetres. The clams seemed to be acclimatized and it was hoped that Coste's attempts had been successful. However, it was not so, for there was a drawback: either the quahogs were not reproducing or the larvae were somehow being destroyed, for not a single young individual was discovered on the island. And so, with the extinction of the imported specimens, the clams disappeared from the waters of the Arcachon basin leaving no descendants.

Other introductions were made elsewhere in France about the same time and though Fischer gives no details of these we can assume they enjoyed as little success as did that described. Eventually, however, a successful naturalization was achieved, though not until some fifty years after Coste's enterprises. The locality chosen was the Seudre basin in Charente-Maritime, the introduction being effected about 1910 by Prunier; the clams were disseminated on the Mouillelande Bank (Ruckebusch, 1949). Apparently Prunier's specimens were quite comparable with those of Coste with regard to size, age and condition, but whereas at Arcachon no reproduction occurred, in the Seudre the animals multiplied prolifically, so that within a few years the species could be considered as definitely acclimatized. At the present time there is a flourishing clam fishing industry centred around Mornac and Marennes. Other introductions, at Concarneau, St-Armel, Sarzeau and elsewhere, were made by Prunier, but these were not successful (Lambert, 1949 b).

Unlike in America, where *M. mercenaria* is harvested almost entirely as a wild crop, a large proportion of those sold in the French markets have been cultivated by clam-farmers who lay down the young clams too small for the table in artificial enclosures or fattening-ponds known as *claires*, where they grow and fatten until they reach the required legal minimum size of 4.5 cm., and also acquire, by the action of *Navicula ostrearia* Bory, the green coloration of the gills and mantle familiar in the Marennes oysters.

In Brittany importation of American clams took place from about 1936, when the decree of January 1933 forbidding all immersion of foreign shells in French waters, to prevent the introduction of *Crepidula fornicata* L. into France, was relaxed conditional to all such importations being inspected for parasites or commensals by a delegate of L'Office Scientifique des Pêches (Lambert, 1949 a). The clams were laid down mainly in the River Belon. The outbreak of

war prevented importation of clams after 1939, and this was not re-commenced until 1954. These animals were intended for immediate sale and normally spent only a short time in the various streams and *claires* where they were stored. However, certain individuals escaped subsequent discovery, remaining where they were planted for many years; thus Marteil (1956) records the finding of large specimens about twenty years old in the River Etel, and some as large as 14 cm., weighing up to 500 gm., in *claires* of the Gulf of Morbihan and the River Penerf, all of which had been laid down in those spots before 1940.

In 1947 a fifteen-year old clam was found in the River Bono, and in 1954 and 1955 others were discovered at the same place, and three more at Plessis in the River Auray, of which the River Bono is a tributary, and like it an important district for oyster culture. At neither of these localities had *M. mercenaria* been laid down. Hence it would seem that, contrary to previous opinion, this species had been able successfully to breed in Brittany. Marteil later verified the occurrence of young individuals at several such points on the south coast of Brittany, and in November 1955 discovered a colony of seven clams aged from three to ten and a half years at Sainte-Avoye on the River Bono.

OTHER EUROPEAN OCCURRENCES

Kaas (1937) reports the finding of a single left valve, fresh enough still to bear the remains of the periostracum, at Westkapelle-Domburg in Zeeland, Netherlands, on 14 March 1933, and also mentions the discovery by Leloup in April 1937 of a complete living example of *M. mercenaria* in the sluice basin of Ostend harbour, which specimen is now in the spirit collection of the Koninklijk Natuurhistorisch Museum in Brussels. Kaas leaves open the question of whether these two specimens were imported with French oysters, or whether the species is extending its range northwards, as was the case with *Petricola pholadiformis* Lamarck.

NATURAL HISTORY AND ECOLOGY

The gametogenesis of *M. mercenaria* has been described by Loosanoff (1936, 1937 a). The adults are with few exceptions of separate sexes, but in their first year most individuals possess distinctly bisexual gonads with very strong male predominance. Spawning in the quahog is a group reaction stimulated by a hormone carried on the sperm (Nelson & Haskin, 1949). Old clams, "blunts," do not reproduce, though they contain spawn. The early larval development is recounted by Chestnut (1951). The veligers remain in schools and as planktonic animals drift passively with the moving tidal masses. Within the temperature range 18° - 30°C. the rate of growth of larvae is generally more rapid at higher temperatures, but at lower temperatures the larvae do not reach a larger size before setting (Loosanoff, Miller & Smith, 1951). After a variable time the larva

becomes a pedoveler, the foot being extended as the swimming larva approaches the substratum; once contact is effected it moves over the substratum, then may swim off to a different site, alight and crawl further. This behaviour may be useful in locating favourable bedding surfaces and is displayed for several days. During this searching period a byssal gland develops and the clam commences weak byssal attachment to the substratum. Soon the velum is lost, and for a number of weeks there is alternation between byssal attachment and crawling. When the animal reaches a length of 7 mm. the byssal gland ceases to function and position is retained solely by the foot (Carriker, 1956).

The quahog is a robust species and will tolerate a wide range of temperature and salinity. If taken from the water the valves are kept tightly shut to prevent evaporation and in this fashion the animals can survive for a considerable period, even if subjected to quite high temperatures. Ruckebusch (1949) tells of a case where clams were found alive and well in the soil of *claires* dried up for a month, the bottoms of which were fissured and had been exposed to the sun during that period. The same heat tolerance is found if the clam is in a large volume of water, though in a restricted volume death is rapid, due to the toxic effect of the decomposition of marine organisms less well adapted to the temperature increase. The quahog protects itself from extremes of cold by burrowing deeper into the substratum.

It has been stated (Nelson, 1928) that the spawning temperature of a bivalve mollusc is a constant throughout the range of a species, and that this critical temperature for *M. mercenaria* is 24° - 25°C. Subsequently, however, several instances have been noted of quahogs spawning at temperatures somewhat lower than this (Loosanoff, 1937 b; Ruckebusch, 1949; Loosanoff and Davis, 1950). Dr. H. J. Turner (*in litt.* 13. v. 1960) tells me that although the minimal temperature at which the quahog will spawn is between 20° and 21°C., this temperature must probably be maintained for a considerable period of time; as larval development is slow at the lower temperatures anyway, this means that optimal conditions for propagation require temperatures of something above 23°C. The variation may indicate physiological races, or factors other than temperature may be involved, as Loosanoff (1939) suggests for the spawning of *Ostrea virginica* at low temperatures.

Although the adult clam may be found from areas where the salinity is low to others where it is almost oceanic, the salinity tolerance of the juvenile stages is more critical. Thus Davis (1958) has determined the optimum salinity for the development of eggs into straight-hinge larvae to be about 27.5 p.p.t. for clams from Long Island Sound. It is apparently not known at present to what extent, if any, the salinity tolerance of clam eggs and larvae is influenced by the salinity at which the parent clams develop the gonads, nor whether races tolerant of low salinities exist or can be developed. As the

salinity is experimentally raised or lowered from the optimum level, so a progressive increase in mortality rate is observed. Once setting of the larvae has taken place the resistance to low salinities is increased. Davis does not mention the effects of high salinity on the larval stages, but Dr. V. L. Loosanoff (*in litt.* 5. vii. 1960) tells me that he has successfully grown clam larvae in water of virtually oceanic salinity, approx. 33 p.p.t. It would seem then that though *M. mercenaria* is a typical lower estuarine form, the range of the species may nevertheless be extended by the passive transfer of the larvae by the tidal currents to other sites suitable for their successful growth and metamorphosis.

Little appears to be known of the oxygen requirements of the quahog. Its occurrence in substrata containing a considerable amount of organic matter, where the oxygen tension of the water immediately above the bottom surface is reduced, indicates that this species is capable of existing at a low oxygen concentration. *M. mercenaria* is found from the intertidal area to a depth of several fathoms. It is not known what determines its lower limit, but it is possibly the nature of the substratum, into which the quahog buries itself to a depth of about 10 cm. The optimum substratum would seem to be mud containing a substantial proportion of shell and small stones. Too firm a consistency prevents the juvenile clams from burrowing, whereas in too fine a matrix the young clams are washed away. With a substratum of mixed mud and shell, the fine mud in which the clams are embedded is retained among the larger particles.

Pratt (1953) has shown that the growth rate of the hard clam depends directly or indirectly on the nature of the substratum; populations living on sand grew 24% faster than did those living in an adjacent plot of sandy mud containing much organic matter. The lower sediment permeability of a substratum with a higher silt-clay content may result in the accumulation of growth inhibitory substances in muds. Aquarium observations have shown (Pratt & Campbell, 1956) a direct correlation between the silt-clay content of the sediment and the rate of expulsion of pseudo-faeces, and it is argued that the inhibition of growth in fine sediments may result in part from the interruption of feeding and the additional expenditure of energy occasioned by the necessity for frequent cleansing of the animal's filtering apparatus. It is not known to what extent the setting larva can select a suitable bedding surface.

Growth rates also proved to be a function of the abundance of small planktonic diatoms, a correlation which was interpreted to mean that this constituent of the phytoplankton, either living or as detritus, is an important source of quahog nutrition. Differences in the current speed, dissolved oxygen content or the salinity of the bottom water had no appreciable effect on the growth rate of the quahog.

ANALYSIS

(Note : for convenience of comparison, temperatures have where necessary been converted to the centigrade scale.)

INFLUENCE OF TEMPERATURE

From the ages of the clams at Sainte-Avoys, Marteil (1956) calculated that in each case the year of spawning corresponded with a year in which the mean monthly water temperatures for July and August were significantly above average and were comparable with the temperatures considered to be the minimum at which breeding can occur in this species. Thus it seems not unlikely that, at least exceptionally, breeding of *M. mercenaria* can occur in Brittany.

In England temperature requirements would also appear to be adequate, at least on the south coast. The specimens from Lee-on-the-Solent were $7\frac{1}{2}$ years old when discovered in 1956, having thus been spawned in the summer of 1949, the notoriously hot summer which was responsible for the abundance of *Octopus vulgaris* Lamarck in the Channel the following year, and specimens collected at Weston in May 1960 were considered to have been spawned in the years 1949, 1951, 1952 and 1955, the weekly maximum sea water temperature for Southampton Water being higher than 20°C. during the whole period 11 July to 12 September, 1955.

It was seen above that the quahog was considered to have bred in the Humber in the late nineteenth century, from its apparent increase there from 1868 to 1889. Contemporary sea temperature recordings are scarce. Dickson (1899) gives the August mean monthly surface water temperature at the Spurn Head Light Vessel as 14.8°C. for the thirteen years 1880-1884, 1890-1897. At the Humber Light Vessel 18.9°C. was recorded in August 1893, 1897 and 1901 (Meteorological Office *in litt.* 20. i. 1960). The water temperatures obtaining actually in the Humber would have been several degrees higher than those recorded at the light vessels, but it is not likely to have approached 22°C. Mrs. N. F. McMillan (*in litt.* 18. iii. 1960) informs me that Liverpool Museum has a specimen measuring 70 mm. from the hinge to the lower margin, and 75 mm. from end to end, found at Cleethorpes by fisherman Harper. The date of finding is not known, but as it was in the collection of J. R. Hardy it must have been some time around 1900. The origin of the Humber colony, according to Petch (1907), was the accidental introduction of clams with American oysters for the Cleethorpes beds. It is possible that their introduction in this way was to some extent deliberate. In either case a periodic replenishment may have occurred, which would account for the seemingly long life of the colony, and obviate a breeding hypothesis. As to the end of the colony, that would be accounted for by the cessation of shipments of American oysters.

For the Liverpool Bay area, Dickson records 15.9°C. for the mean August surface sea temperature at the North-West Light Vessel for the



MERCENARIA MERCENARIA (L.), Gosport, 1956.

Length, 72 mm., height, 59.5 mm., weight, 92 g.

sixteen years 1880, 1881, 1883-1891 and 1893-1897. The Meteorological Office (*in litt.* 20. i. 1960) records the highest daily readings for 27 years at the Bar Light Vessel as 20.6°C. in August 1947 and 21.7°C. in July 1934, but considers that a 5°F. error may have been made in the latter reading, and that 18.9°C. is more likely. Here again temperature conditions do not seem suitable for the spawning of *M. mercenaria*. With the exception of the 1859 Bootle specimen, all the known specimens from this area were deliberately introduced. Shrubsole's evidence that breeding had occurred on the Cheshire coast will be examined below. The only remaining specimen seems to be a shell in Liverpool Museum, labelled Hilbre Island, measuring approximately 60 mm. from hinge-line to lower margin, and from end to end (Mrs. N. F. McMillan *in litt.* 18. iii. 1960).

The origin of the Hampshire quahogs is not known, though there is certainly no history of deliberate introduction. A possibility is the accidental introduction with imported oysters to the Langstone Harbour oyster beds, but this would indicate their coming to the Solent 35 years ago when those beds were flourishing, and no shells have been recorded from that locality. It is not impossible that larvae of *M. mercenaria* may have drifted across the Channel as planktonic animals, as has been demonstrated for *Octopus vulgaris* by Rees & Lumby (1954); we have already noted that the larvae are able to survive the salinity of the open sea, which in the Channel is about 35 p.p.t.

Whatever the origin of the colonies there seems to be no doubt that, at least in Southampton Water, the clams are thriving and in certain years reproducing. I visited the colony at Weston in May 1960 and obtained nine living specimens; from the growth rings the age of the largest specimen was determined as 10½ years, and of the smallest as 4½ years. The abundance of the species here was indicated by the presence of many hundreds of single and double valves which littered a large part of the area. All the quahogs found alive were either partially buried or just below the surface, being discovered by digging below a siphon-hole with a garden hand-fork. Almost all the empty shells of *M. mercenaria* were present as large fragments, the ligament in most cases being intact; this indicates the work of predators. Mr. Wm. Conway, of Southampton, informs me (*in litt.* 24. vii. 1960) that at Marchwood Power Station numbers of gulls have been observed lifting quahogs into the air and dropping them on the concrete sea wall; the impact appears generally to damage only the outer edge of the shell, allowing the gull to insert its beak and dig out the flesh.

I am indebted to the Southampton Harbour Board for supplying copies of the weekly maximum and minimum temperatures, from October 1953 to April 1960, of the sea, taken from their thermograph recorder at Calshot, at the entrance to Southampton Water. Assuming the minimum temperature at which the quahog will spawn to be between 20° and 21°C., the critical temperature was recorded each

summer during this period except in 1954, the highest record being 22.8°C. in July and August 1959. The reason for using Calshot is that the temperature of the water in the upper part of Southampton Water around the docks is raised by heated water from the power station and would not give a true record of the ambient temperatures in Southampton Water. The temperatures obtaining in the immediate neighbourhood of the clam colonies would therefore be a few degrees higher.

INFLUENCE OF SALINITY

In America *M. mercenaria* lives naturally where the salinity ranges from 20 to 28 p.p.t, though it may occasionally be present in salinities as low as 10 p.p.t. (Chestnut, 1951). It will be noticed that all the European occurrences have been in regions of brackish water. This ecological factor is probably of rather less importance than the nature of the substratum, which will naturally have a higher silt content in the proximity of the mouth of a large river.

INFLUENCE OF THE SUBSTRATUM

The earlier authors do not give details of the nature of the soils in which their specimens were found, as the substratum was then regarded merely as an inert supporting medium. We now know that the influence of this factor is considerable and is thought to have been the chief reason for failure of the colony in the Arcachon basin. In the cases of accidental introduction of clams on established oyster beds it is reasonable to assume that the specially prepared soils for oyster culture are adequate also for the successful rearing of young clams, and reasons for the failure of these colonies must be looked for elsewhere. Marrat (1883) mentions "the extensive shallow sandy shores of Lancashire and Cheshire," and Shrubsole (1885) talks of "the various sandbanks in the estuary of the Mersey"; we may therefore infer that with regard to this ecological factor conditions in the Liverpool Bay area were tolerable if not optimal.

The recent specimens I have seen from the Solent have been taken in predominantly sandy mud. The colony at Weston was visited at low tide when a hundred yards or more of flat was exposed, being for the most part mud with a large amount of shell and small pebbles in it. The mud was black below the surface, but was not foul-smelling, the consistency being mostly firm enough to bear my weight.

The successful Mouillelande bank in the Seudre, the site of a former oyster bed, is largely composed, according to Ruckebusch (1949), of a firm soil on which the foot does not slip and contains shell débris and gravel which retains the mud and prevents undermining by the current. Moreover, the Mouillelande bank is sheltered from gales and excessive tidal movements. Marteil's description (1956) of the soil at Sainte-Avoye is similar: firm soil of mud mixed with oyster-shell débris. By contrast, the soil of the north-east part of the Ile aux Oiseaux, where the Arcachon clams were laid down, is a thick

mud which requires the use of mud-shoes for its crossing as its consistency is soft and, moreover, it is subjected to a fairly strong current.

An interesting and as yet unexplained fact is that whereas prolific reproduction may occur in the various channels and streams of the Seudre, in the *claires* served by salt-water streams which themselves flow into the main channels, either reproduction does not occur or the embryos are destroyed. Although the bottom surface is somewhat softer here than in the main channels, agitation from the flow of water is slight and would not seem to be sufficient to smother the juvenile quahogs (Ruckebusch, 1949). Neither is the current flow strong enough to wash out the setting larvae. Adult animals grow well and maturation of the gonads occurs. Perhaps the oxygen tension of the water of the fattening-pools is below the tolerance of the larvae, but one can only state empirically that *M. mercenaria* requires running water during its earliest stages of development.

CONCLUSIONS

The success or failure of the various colonies can now be reviewed in the light of the availability of the essential environmental requirements examined above.

BOOTLE, 1859 :—No colony, single specimen only; origin attributed to ballast.

HUMBER, 1864-1907+ :—Accidental introductions with American oysters; individuals may have survived for some time, but no evidence of breeding; water temperature too cold, other factors apparently adequate; expiry of colony with death of remaining specimens after importation discontinued.

MERSEY, 1869 :—Deliberate introduction by Moore; water temperature too low for reproduction, but this does not explain the total disappearance of the imported adults; possibly sandy soil too firm to permit sufficiently rapid burrowing to protect animals from predators.

HILBRE ISLAND, 1882 :—Clams had been laid down nearby for storage in 1879; no specimens found alive but over a hundred shells found in fresh condition; Shrubsole thought there was evidence of breeding having occurred, since from the size of the shells he imagined some to be only a few months old. As Shrubsole did not know the identity of his specimens, we may assume he was similarly unacquainted with their growth rate; at "a few months" their size would have been about 10 mm., but in a letter to Marrat the size of the specimens is given as "from one to three inches, and over" (Marrat, 1883). Thus the size of the smallest specimens could certainly correspond with a three years old animal, especially as the growth rate is less at lower temperatures. Shrubsole further points out that they would not "have been

worth importing for table use," but it must be remembered that they had been laid down for storage until such time as they should reach a suitable size for eating. It is, moreover, quite conceivable from the methods used to harvest the clams that the barrels would contain a proportion of individuals of a very small size. It remains to explain why over a hundred specimens, many in a fresh condition, were littering the sandbanks; Marrat provides the answer when he mentions the "stormy weather prevailing at the time," obviously the quahogs had been washed out from the sand by the rough seas and had been stranded where they were easy prey to sea-birds and other predators.

DEE, 1883 :—Deliberate introduction by Moore; conditions probably similar to those of the 1869 introductions; no evidence of survival; death possibly due to predation or shifting of the subsoil.

MENAI STRAITS, circa 1920 :—Accidental introduction with American oysters; even if temperature requirements adequate, population density here probably far too low for effective spawning to have been possible; expiry of colony when beds abandoned.

SOLENT & SOUTHAMPTON WATER :—Origin unknown, no history of deliberate introduction; oldest specimens found so far were spawned in 1949, youngest in 1955; all environmental conditions seem to be adequate; it has been suggested above that under favourable conditions of current pelagic larvae may have reached the south coast from breeding grounds in Brittany.

ARCACHON BASIN, 1861 and 1863 :—Deliberate introductions by Coste; adults survived and grew but no juveniles survived; substratum too soft; other conditions apparently satisfactory; expiry of colony with death of imported specimens.

SEUDRE, 1910-present day :—Deliberate introduction by Prunier; all requirements apparently adequate, though reproduction does not occur in the fattening-ponds; now an important local industry.

BRITTANY, 1936-1939 and 1954-present day :—Escapes from storage enclosures and overlooked specimens; temperature high enough for spawning in certain years; other conditions satisfactory; possible source of the recent British colonies.

OTHER EUROPEAN OCCURRENCES :—A single left valve at Westkapelle-Domburg, 1933 and a living specimen in Ostend harbour 1937; origins unknown, possibly accidental importation with French oysters or pelagic larvae from France by Channel current.

It remains to be seen whether there are any further European colonies as yet undiscovered, and whether any extension of the present range of the species will occur. We can but hope that the naturalization of this species on our shores will to some extent compensate for the introduction of those other less welcome American visitors, *Crepidula fornicata* and *Urosalpinx cinerea* (Say).

Specimens from Weston, 1960, are now in the spirit collections of the British Museum (Natural History) and the Liverpool City Museum.

Finally, I want to express my gratitude to all those who have assisted me with this survey over the last four years, particularly to Mr. R. V. Wells, of the Portsmouth and District Natural History Society for considerable help in the early stages and to Mrs. N. F. McMillan for her valuable aid in finding old records and for the loan of Marrat's rare paper, but perhaps most of all to my sister, Janet, without whose presence many of the recent British specimens would not have been found.

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ACHATINA FULICA HAMILLEI (PETIT) IN THE KAVIRONDO DISTRICT OF KENYA

By B. VERDCOURT

(Read before the Society, 18 March 1961)

THIS species of *Achatina*, at least in its typical form, has spread throughout the Old World Tropics. In East Africa it has been known only from the coastal belt and from certain areas further inland where a Somali type of fauna and flora extends as a wedge into Kenya and Tanganyika. In the coastal belt subsp. *hamillei* is involved but in the drier inland areas subsp. *rodlatzi* Dunker occurs. It therefore did not occur to me to suspect that it might be this species which had been observed when two quite independent persons mentioned to me that they had seen some "big snails" on the walls of the Kisumu Hotel, Central Kavirondo District, Kenya, a town situated on the N.E. shore of Lake Victoria. Neither of these persons collected the mollusc which I suspected might be *Burtoa*. Mr. D. M. Brown, an American collector of native drug plants, kindly offered to collect

some of the snails for me. Two juveniles were obtained in the grounds of the Kisumu Hotel (29th Jan. 1961, leg. D. M. Brown) and one adult on the lake shore S.E. of Kisumu (29th Jan. 1961, leg. D. M. Brown) (both lots in the Coryndon Memorial Museum, Nairobi). The adult is absolutely typical of race *hamillei* though rather a worn shell. I am certain that these specimens are part of a colony introduced by some means from the coastal area some 450 miles way. There is a direct rail link between Mombasa and Kisumu and juvenile or even adult molluscs could be introduced. Since the species has spread all over the world in numerous diverse habitats it is strange that it has not extended to every suitable habitat in Africa, but such is undoubtedly not the case and I have considered this instance as worthy of record in case a wholesale spread in the future obscures our knowledge of the true original distribution of this snail.

BOYSIA BOYSII (PFEIFFER) (PUPILLIDAE) IN AFRICA

By B. VERDCOURT

(Read before the Society, 21 January 1961)

I HAVE recently (1960) given some account of the molluscs collected by Mr. C. F. Hemming in north-east Tropical Africa. During September 1960 Mr. C. F. Hemming travelled in the northernmost parts of what used to be called Somaliland Protectorate. He made a remarkable collection of molluscs, which will take a very long time to work out. Apart from containing some striking new species, it also contains many species which are new records for Somalia; perhaps the most important of these is a single specimen of *Boysia boysii* (Pfeiffer), previously known only from India. A full discussion of the species, together with figures, is given by Pilsbry (1921, p. 226, pl. 24, f. 14-17).

The specimen was collected as follows :—

SOMALI REPUBLIC (NORTH REGION) (SOMALILAND PROTECTORATE). Ala'ouleh, 9 miles N.W. of Sheik, narrow valley above cultivated area in *Buxus hildebrandtii*—*Cadia* zone at lower fringes of *Juniperus* forest relicts, 5,600 ft., 18 September 1960, C. F. Hemming 167 (Coryndon Museum).

The flora and fauna of India and Africa naturally have a good deal in common and a fair number of species are to be found in both areas, but such individual distinctive species give more emphasis to this zoogeographical fact. This present record fits in with a generally held idea that a good deal of Africa's flora and fauna found its way into Africa by migration from the north-east or was derived from an element which did so in the past.

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BOOK NOTES, ESPECIALLY RELATING TO TURTON'S WORKS

By N. F. McMILLAN

(Read before the Society, 19 November 1960)

1. *The Shells of Torbay and Exmouth*, by Mary Salter.

TOMLIN (*Proc. Malac. Soc.* **22**, 162, 1937) gave an account of this little book and mentions some other works by the same author. Several are in the Liverpool Public Libraries (Reference Dept.), and from them I have made the following notes. *The Shells of Torbay and Exmouth* was published in London, 1904, price one shilling. With the Liverpool copy is bound *The Bexhill Supplement* (January 1905, London) of 2 pages and plate IV entitled *Illustrations of Sussex Shells and Zoophytes*. This curious little supplement was apparently unknown to Tomlin.

In another of Miss Salter's works (*The Point Theory of Creation*) some autobiographical details are given. Mary Salter was born in Torquay, 12 April 1858, the eldest of ten children. Her father was an artist, her mother the eldest daughter of John Stabb, a Newfoundland merchant. Our author was a pupil of William Pengelly for some time. A portrait of Mary Salter appears in *A New System of Geology with Archaeological Proofs of the Destruction of the World by Water and Fire* (n.d.), and a different portrait in *The Font and Destiny* (published by the author at Kingskerswell in 1939).

2. Wodarch's *Introduction to the Study of Conchology*.

Iredale (*Proc. Malac. Soc.* **15**, 83-84, 1922) described a "Fourth Edition, with considerable Additions and Alterations" (London, 1832) and Tomlin (*Proc. Malac. Soc.* **25**, 141, 1943) gave some additional details, adding that he had not seen a copy of this edition with plain plates. My copy has plain plates, apart from the fine coloured frontispiece.

3. *The Conchologist's Companion*, by Mary Roberts.

Iredale (*Proc. Malac. Soc.* **15**, 86, 1922) mentions this work as having been published in 1834, with a Baxter type frontispiece, but it is referred to, as he points out, in *Lessons on Shells* (1832). I have not been able to find any mention of an edition of *The Conchologist's Companion* other than that of 1834, but among the Stelfox books, now in Liverpool Museums, is a copy of this earlier edition. The title runs *The Conchologist's Companion; comprising the Instincts and Constructions of Testaceous Animals; with a General Sketch of those extraordinary productions which connect the vegetable and animal kingdoms. By the Author of Select Female Biography; Wonders of the Vegetable Kingdom: etc., etc., London, 1824.* The book

comprises 17 "letters" or chapters (there are 12 in the 1834 edition) and lacks the frontispiece and text-figures of the later edition. Wheldon and Wesley had a copy of the 1824 edition for sale in 1958.

4. Turton's *Enumeration of Marine Shells found on the Devonshire Coast*.

This work of William Turton's seems to be very little known, and as I was fortunate enough to come across some additional information concerning it lately, details are given here.

Jeffreys (*British Conchology* 4, 108, 231) refers to a publication entitled *Enumeration of Marine Shells found on the Devonshire Coast*, which was presented to him by Dr. Turton "from the author," and which was published in 1829. In 1903 B. B. Woodward stated that the *Enumeration* was the conchological section of Part 2 of Carrington's *The Teignmouth, Dawlish, and Torquay Guide*. Iredale (*Proc. Malac. Soc.* 11, 171-2, 1914) gave further details of this Guide, Part 2 of which was titled *The Natural History of the District* by W. Turton and J. F. Kingston, and dated on the spine 1830. Iredale also pointed out that the generic names *Tornus* and *Haminoea* both date from this work.

Recently when looking through the 1824 edition of Mary Roberts' *Conchologist's Companion* I saw a reference to *The Teignmouth Guide* which obviously referred to a much earlier edition than any yet known. Sherborn (*Index Animalium*) only lists Carrington's 1830 *Guide*, but enquiries of the Devon County Library at Exeter bore fruit, and by the kindness of the Librarian, Mr. E. J. Coombe, F.L.A., I have been allowed to examine two editions (1817; 1818) of this earlier *Teignmouth Guide*, both containing Turton's *Enumeration*.

The full title is: A/ GUIDE/ TO THE/ WATERING PLACES,/ ON THE COAST,/ BETWEEN/ THE EXE AND THE DART;/ INCLUDING/TEIGNMOUTH,DAWLISH,/ AND/ TORQUAY,/ EMBELLISHED WITH A GENERAL VIEW OF/ TEIGNMOUTH AND DAWLISH,/ AND THE VARIOUS/ SEATS AROUND THEM/ WITH A SHORT DESCRIPTION OF THE NEIGHBOURHOOD;/ Teignmouth: Printed and sold by E. Croydon, Public Library. 1817. The contents are as follows: Frontispiece (map); pp. v-viii, Introduction. Pt. 1. Teignmouth, pp. 1-98. Pt. 2. Dawlish and its Vicinity, pp. 1-84. Pt. 3. Torquay and its Vicinity, pp. 5-72. Next comes the *Conchology*; this has 17 unnumbered pages, and a separate title-page: CONCHOLOGY./ AN ENUMERATION/ OF SUCH/ MARINE SHELLS,/ AS HAVE BEEN FOUND/ ON THE/ ADJACENT COASTS,/ WITH REFERENCES,/ TO THE/ BEST ENGRAVED FIGURES.

The *Conchology* section is identical in the two editions. The *Conchology* is unsigned, but is unmistakably an earlier version of Turton's *Enumeration* mentioned by Jeffreys. Neither *Tornus* nor *Haminoea* is mentioned in the 1817 edition, so that this earlier *Enumeration* does not involve any changes in nomenclature.

5. Turton's *Conchological Dictionary of the British Isles* (1819).

Three copies of this book which I have examined all differ in details. Salisbury (*J. Conch.* **22**, 158, 1945) mentions the existence of copies with plain plates instead of the more usual coloured plates. My copy with plain plates has no frontispiece; the plate bearing figs. 38-44, which forms the frontispiece in the coloured-plates copy, is in my plain-plates version placed in its correct numerical place among the other plates at the end of the book.

The Stelfox copy (now in Liverpool Museums) is in the original grey boards, and on the back appears the following inscription: *Turton Conchological Dictionary of the British Islands. One Hundred Figured Specimens. Plain, 9s. Coloured, 14s. ditto. Copies for Marginal Additions with Plain and Coloured Sets of the Plates etc. . . . for the Use of Collectors.* There is no frontispiece; the plain plates are all placed together immediately before the text (pp. 1-272). At the end are two pages of advertisements of books published by John Booth. These 2 pages also appear in my plain-plates copy.

My copy with coloured plates has the plates scattered throughout the text (? rebound).

6. Turton's *Conchylia Dithyra Insularum Britannicarum* . . .

I have a copy of the 1848 reprint of this which has been extra-illustrated with 131 small photographs of various shells mounted with the background carefully cut away. A. G. Wrigley exhibited what seems to have been a similar volume to the Malacological Society in 1932 (*see Proc. Malac. Soc.* **20**, 79); it is described as "Turton's *Conchylia Dithyra*, 1848, with 131 photographs by S. Hanley" but I have been unable to trace its present location. My copy gives no indication of the identity of the photographer, but the photographs are obviously old.

ON THE OCCURRENCE OF *BURTOA NILOTICA* (PFEIFFER) IN ETHIOPIA

By T. E. CROWLEY and T. PAIN

(Read before the Society, 17 December 1960)

THE occurrence of the nominate race of *Burtoa nilotica* (Pfeiffer) within the highland region of Ethiopia has always been within the bounds of possibility, but confirmation of it has so far been lacking. In consequence of this we refrained from any reference to it in our revision of the genus (Crowley and Pain, 1959, *Annales du Musée Royal du Congo Belge*, **79**). The most north-easterly record so far is the Boma Plateau in the Sudanese Province of Equatoria, where subfossil specimens were obtained by J. G. Myers at Nilichu, altitude 3,700 ft., in 1939.

Through the kindness of Dr. R. Kiliyas, we have been able to examine two juvenile examples of *B. n. nilotica*, collected by O.

Neumann at Anderatscha in the Ethiopian Highlands, and now preserved in the Berlin Zoological Museum. Although very immature, there is no doubt as to the true identity of the specimens, and their existence extends the range of *Burtoa* far to the north-east of the boundary line shown on our distribution map (Crowley and Pain, 1959, 16).

It is to be hoped that further confirmation of the occurrence of *Burtoa* in Ethiopia may come to light in due course. For the time being the actual range of the genus in that country must remain a matter of conjecture, but that it does in fact occur there is now beyond doubt.

ZIRFAEA CRISPATA (L.) IN ORKNEY

By ROBERT RENDALL.

(Read before the Society, 17 December 1960)

DURING extreme spring tides in the early part of 1958 a local fish merchant brought me a living specimen of *Zirfaea crispata* (Linné). It was obtained from soft rock at the northern extremity of Berstane Bay, from a spot where rock and sand come together to the south-east of the Head of Holland. The specimen was well grown, with a shell measuring 65 mm. in breadth. On the following day I obtained another *Zirfaea* of similar size, valves only, and also boulders of sandstone with old borings.

In my *Mollusca Orcadensia* (1956) I noticed the presence of valves of *Z. crispata* in sandy bays along that Sound situated between the Mainland of Orkney and the island of Shapinsay, and observed: "The shores adjacent to the String indicate that they [*Z. crispata*] have a colony somewhere in that tideway." What had not occurred to me, but was now quite apparent, was that the Head of Holland rock, being an outcrop of the soft Eday Marls, provided a most suitable habitat for *Zirfaea*. In other words, the determining factor in the local distribution was geological.

On 25 November 1958 I revisited the spot but the tide, though low, was not far enough out to permit search of the place where the specimens were found. However, low on the middle shore I came upon silted up shell borings. These contained specimens, shells only, of *Z. crispata*, measuring, on an average, only 45 mm. in breadth. A few cavities contained living *Paphia pullastra* var. *perforans*, mostly about 36 mm. in breadth. Cavities inhabited by these live *Paphia* still contained in some instances the shell of the original inhabitant at the foot of the boring.

REFERENCE

RENDALL, R., 1956. *Mollusca Orcadensia*. *Proc. Roy. Soc. Edinb.*, **66**, 194.

An account of this discovery is given in the author's *Orkney Shore* (Kirkwall, 1960), pp. 101-103. *Editor*.

REVIEW

Orkney Shore. ROBERT RENDALL. The Kirkwall Press, Kirkwall, 1960. Pp. 200. Price 15s.

THIS charming volume is not easy to review. It is not an Orkney Fauna though brief faunal lists of several invertebrate groups are given; it is not an autobiography though a large part is autobiographical. Marine biology and autobiography are inextricably intertwined, so let us leave it at that.

Mr. Rendall's lifelong devotion to marine biology and in particular to the Mollusca is the leit-motif of the book, which is full of interesting observations. He has not only scoured the Orcadian shores but has dredged extensively in Orkney waters also; he has studied the habitat of the living animal and considered the mathematical significance of the form of the shell. On p. 143 he pokes gentle fun at some scientific writers who embellish their papers with graphs; the reviewer (who dislikes graphs) was delighted with Mr. Rendall's comments upon their looking like fleets of battleships and distant skyscrapers.

There are so many good things in the book that one wishes for more! One notable omission is the absence of any account of the fauna of that Orkney speciality, the "oyce"; these tidal lagoons, whether salt or brackish, would surely be fruitful fields of investigation.

The section on previous workers on the Orkney marine fauna will interest many beyond Orkney and we are grateful to Mr. Rendall for the pains he has taken to unearth details of these early naturalists. There are, however, a few discrepancies, and one wonders if perhaps these are due to more accurate knowledge obtained locally by Mr. Rendall? For instance, the Rev. Charles Clouston is stated to have died in 1884 but 1885 is the date given in Britten & Boulger's *Biog. Index Deceased Brit. & Irish Botanists* (2nd ed. 1931). Again, A. R. Duguid is said to have died in ? 1869 but according to Britten & Boulger he died in 1872. One wonders also why the conchologist Dr. William Traill (son of Mr. Traill of Westness, Rousay) is not mentioned. Much of his life was spent abroad in the service of the East India Company, but after his retirement he spent every summer in North Ronaldsay where he made zoological studies. (A long and interesting obituary of Dr. Traill appeared in the *Fifeshire Journal* for 3 March 1887.) Traill's shell-collection was presented after his death to the Museum at St. Andrews.

There are a number of irritating misprints, and Prof. J. A. Steer's volume in the New Naturalist series is *The Sea Coast*, not *The Shore* (p. 64). But these are small points. Mr. Rendall has given us a delightful book, one to read and re-read and enjoy.

N. F. McMILLAN.

OBITUARY

PAUL BARTSCH, 1871-1960

THE passing of Paul Bartsch at the age of 88, marks, in a fashion, the end of an era in American malacology, for he was the last of those whose scientific activities spanned the last and present centuries.

Dr. Bartsch was born on 14 August 1871 in Tuntshendorf, a small village north-east of Glatz in Silesia, Germany (now in Poland). At the age of 10 he accompanied his parents, Henry and Anna (Klein) Bartsch to America, where they settled, first in Missouri, and then near Burlington, Iowa. As a schoolboy Bartsch was intensely interested in nature, roaming the fields and the Mississippi river valley near his home, particularly observing the birds of the region. Early in life he learned to mount birds and prepare skins, of which he accumulated a considerable collection.

Entering the State University of Iowa at Iowa City in 1893, Bartsch came into close contact with many distinguished teachers, from whom he received not only a broad basic training in all fields of biology but much encouragement and sound advice. His energy, enthusiasm, and dedication to the acquisition of knowledge led to his completing his college work in three years save for one-half a credit. Thus, when in 1896 Dr. William H. Dall, then Honorary Curator of Mollusks at the U.S. National Museum, wrote to Professor C. C. Nutting, the distinguished authority on hydroids, and one of Bartsch's teachers, telling him of his need for an assistant, Bartsch was the man whom Nutting recommended.

In April 1896 Bartsch came to Washington and started work as Aide in the Division of Mollusks. In spite of the lack of a half-credit the University of Iowa gave him the bachelor degree that June, and in 1899 he received his master's degree. For six years he worked on his doctoral thesis, and in 1905 the same University awarded him the Ph.D. degree.

Because his interests and writings up to that time had been largely ornithological, it was not until 1902 that he published his first scientific notes on mollusks. During these early years he did much of the curatorial work in the division, and assisted Dr. Dall in his researches. When the opportunity arose to transfer to the Division of Birds he turned it down, feeling that there was a greater future for original work in the field of malacology. He never lost his interest, however, in ornithology, bringing back bird skins, ornithological notes, and bird photographs from all of his many trips. He was the first person in America to undertake scientific bird-banding.

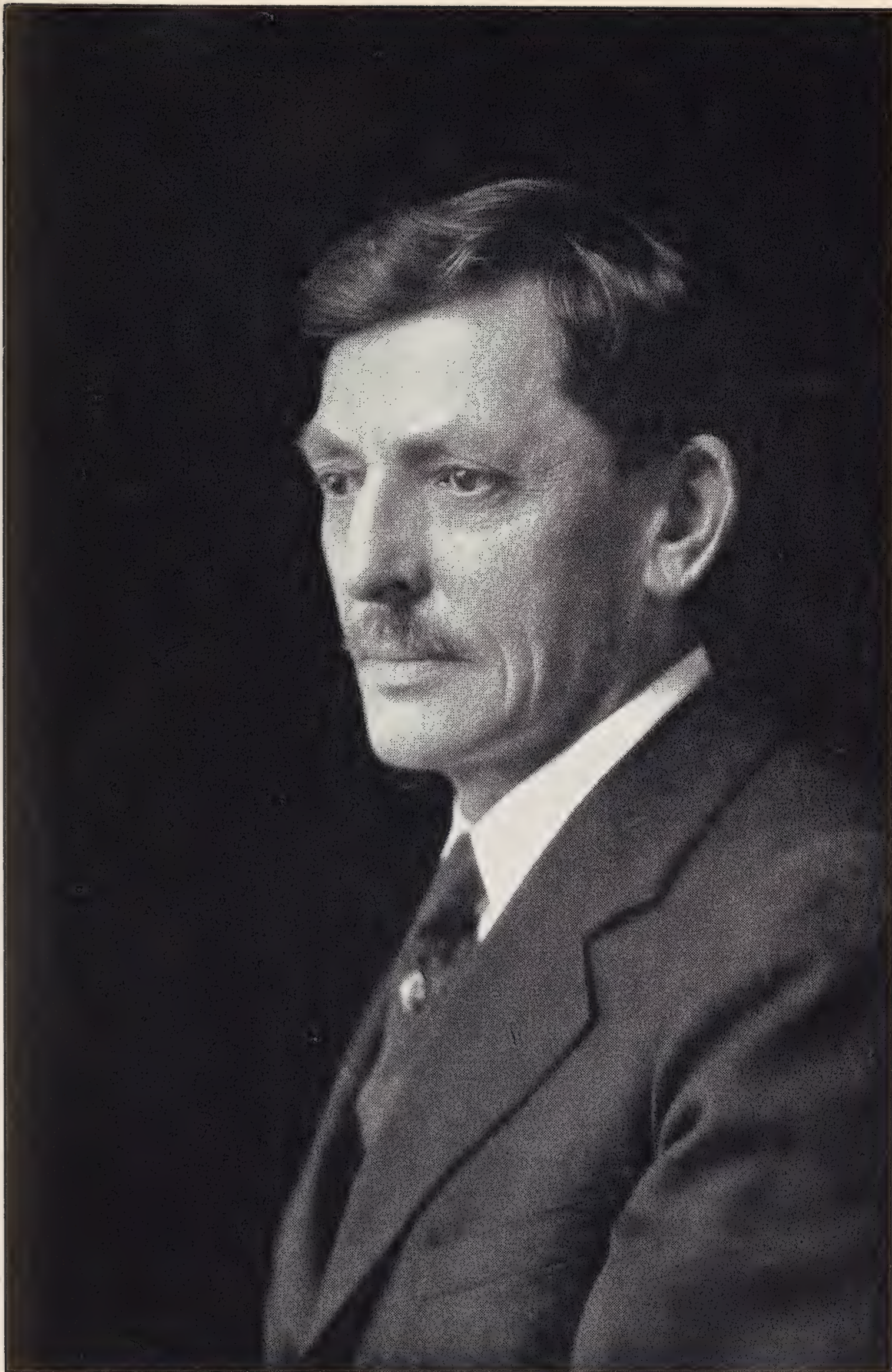
In 1905 he became Assistant Curator, and two years later, from November 1907 to July 1908, he spent about nine months in the Philippines as naturalist on the Bureau of Fisheries steamer *Albatross*. In those months Bartsch gathered together, personally and through his assistants and native collectors, what was probably the largest collection of mollusks ever made on a single expedition, and in addition brought back quantities of other marine animals.

It was the first of numerous trips he made to various parts of the tropics, and his only one to the Old World. All his others were to the warm parts of the Americas, and from each one he brought back much material. He was a tireless worker in the field, and inspired others to work with him hard and long. In 1911 he was in the Gulf of California, and in 1912 in the Bahamas, the first of many visits to the Caribbean area. In the course of these trips Bartsch visited almost every island, large and small, in the West Indies, and the material he brought back from these expeditions resulted in the publications he wrote, together with his friend Carlos de la Torre, on the Annulariidae of Cuba, the Bahamas and Hispaniola, and the Cyclophoridae of the Americas; the manuscript that they prepared on the Urocoptidae of Cuba still awaits publication. The marine mollusks of the Caribbean also claimed his attention; the Johnson-Smithsonian Deep Sea Expedition, of which he was the director, explored the Puerto Rican Deep, and brought back a great variety of marine life, that resulted in 32 papers, containing descriptions of 26 new genera and subgenera and 135 new species.

Early in his malacological career Bartsch made a special study of the Pyramidellidae, led to this difficult group of mollusks through assisting Dr. Dall with the Californian species of his family. It is an interesting fact that the last major work that Dr. Bartsch published dealt with the members of this family in the Florida Pliocene. Other groups of mollusks on which he worked were the minute marine mollusks of the west coast of America, the land snails of the Philippines, the shipworms, and the snails involved as intermediate hosts in schistosomiasis. In all of these fields he made lasting contributions, as his more than 450 papers testify. A member of many scientific organizations, he was a life member of the Conchological Society of Great Britain and Ireland, having been elected in 1907.

Besides his official duties with the Smithsonian Institution, Dr. Bartsch had many outside interests. For thirty-seven years he was in charge of histology courses at the Howard University Medical School, and for forty years he gave courses in zoology and field ornithology at the George Washington University, initiating the graduate work in the natural sciences there in 1912. These teaching duties were carried on outside of his regular hours at the museum, a schedule that would have taxed the strength of most men. In later years Bartsch took great pride in the success of his graduate students in the scientific world, and would tell with pleasure of meeting former students of his from Howard University in responsible positions in islands he visited during his West Indian trips.

Young people also felt the impact of his teaching and enthusiasm, especially in connection with his interest in scouting, where he was actively involved in the promotion of adequate facilities and opportunities for nature study. In his last years he took particular pleasure in talking to the groups of Boy Scouts and Girl Scouts who during good weather came almost every weekend to Lebanon to see the



Paul Bartsch

[To face page 42]

plants, birds and other wildlife of the area. Bartsch was vitally interested in all forms of conservation of nature's resources and beauties, and was a member of numerous societies devoted to this cause.

He retired in 1946 from his duties at the Smithsonian Institution to his 458-acre estate Lebanon on the Potomac River at Lorton, Virginia, some twenty-five miles below Washington. Here he and his wife, a practising physician who survives him, laid out flower gardens, transformed a stream-carved ravine into the beautiful and locally well-known "Fern Valley," and turned the largely wooded estate into a wild-life sanctuary. Here at his desk by the picture window of his large study, added as a wing to the 230-year old mansion, he could look out over the gardens to the waters of Pohick Bay, and watch the hundreds of birds that came to the feeding places outside the window. On 24 April 1960, among these beauties of nature that he loved so well, he passed away, full of years and honours, his memory indelibly enshrined in the hearts and minds of all who knew him.

HARALD A. REHDER.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

**782nd Meeting, held at the British Museum (Natural
History), 15 October 1960.**

The President, Mr. C. P. Castell, in the chair.

Member Deceased

The President announced the death of Mr. H. H. Bloomer, a past president and honorary member of the Society.

Communications

"The naturalization in Europe of the quahog, *Mercenaria mercenaria* (L.)," by D. Heppell.

"*Agriolimax agrestis* (L.) in the Outer Hebrides," by D. Heppell.

"Revision of the freshwater mussels of the family *Etheriidae*," by T. Pain and F. R. Woodward.

Exhibits

Special exhibits: Estuarine Mollusca and Cyclophoridae.

The President: examples of British brackish water Gastropoda from the Kennard collection.

Mr. G. A. S. Barnacle: examples of the genera of Cyclophoridae found in Ceylon.

Rev. H. E. J. Biggs: marine Mollusca found in a Bronze Age ship with a cargo of copper sunk about 1200 B.C. in 90 feet of water in the Gulf of Atalya, Turkey.

Mr. S. P. Dance : *Conus milne-edwardsi* Jousseaume (= *C. clytospira* Melville & Standen).

Mr. D. Heppell : Mollusca from Southampton Water, including *M. mercenaria* (L.).

Mr. B. S. Kisch : Mollusca from St. Jean-de-Luz, France.

Mr. T. Pain : Mollusca from the Congo estuary at Malela, and Indo-Burmese Cyclophoridae.

Mr. T. Pain and Mr. F. R. Woodward : specimens to illustrate their paper.

Mr. G. W. Pitchford : British estuarine Gastropoda; *Viviparus contectus* (Millet) from Lincoln and Oxford, the largest, from R. Witham, measuring 53 × 41 mm.; *Patelloida tessulata* (Müller) from the Binnies Rocks, Firth of Forth.

Mr. R. P. Scase : *Voluta (Cymbiolacca) complexa* and its subspecies *neilseni*, Queensland; subfossil marine shells dredged from mud on the sea bottom, with recent specimens for comparison.

Mr. L. W. Stratton : marine Mollusca from Dale, Pembrokeshire; *Theba pisana* from various localities.

783rd Meeting, held at the British Museum (Natural History), 19 November 1960.

The President, Mr. C. P. Castell, in the chair.

Member Deceased

The President reported the death of Robert William Greenish.

Bequest

The Hon. Treasurer announced that the late Mr. H. H. Bloomer had bequeathed the sum of one hundred pounds to the Society.

Members Elected

The Curator, Natural History Section, Prince of Wales Museum of Western India, Bombay 1, India.

Mrs. Ann F. Cook, N.D.D., Wayside, Pillcreek, Feock, Cornwall.

Percy Elston, 105 Wellfreer Road, P.O. Fynnlands, Durban, Natal, South Africa.

Thomas W. Howe, 1 Huntley's Gardens, Culverden Down, Tunbridge Wells, Kent.

Harry Knudsen, M.Sc., Fyrrevejen 30, Nacrum, Denmark.

Miss Annis Mary Sanders, Rosemary, Fitzalan Road, Littlehampton, Sussex.

Alan Solem, B.S., M.A., Ph.D., Division of Lower Invertebrates, Chicago Natural History Museum, Chicago 5, Illinois, U.S.A.

Communications

"Book Notes, especially relating to Turton's works," by Mrs. N. F. McMillan.

"*Theba pisana* (Müller) in Guernsey," by T. E. Crowley.

"F. C. Lukis and the Triton," by T. E. Crowley.

Exhibits

Special exhibits: *Pisidium* and Mollusca of coral reefs. Examples of British species of *Pisidium* were exhibited by Mr. S. P. Dance (specimens figured by Stelfox in *J. Conch.* **15**, plate 7-9), Mr. A. E. Ellis and Mr. L. W. Stratton. Mr. Dance also exhibited the original drawings by Stelfox from which the plates mentioned were reproduced and specimens and photographs used by B. B. Woodward to illustrate his *Catalogue of the British species of Pisidium*. Mr. Ellis gave some hints on the identification of the species of *Pisidium* and Mr. Dance a historical sketch of the genus.

Other exhibits included: *Cypraea* (*Purpuradusta*) *raysummersi* Schilder, 1960, from the collection of the late R. W. Greenish; a scalariform *Lymnaea stagnalis*, Edgbaston, Dr. P. Makings; *Tridacna* from the Great Barrier Reef, Mr. L. W. Stratton; shells from the South Seas, including *Cypraea aurantia* from Fiji, Mrs. D. M. Tucker; shells collected near Portsdown Hill, Hampshire, Mr. P. T. Wimbeldon; species of *Limicolariopsis*, Mr. T. Pain; *Murex* species, Mr. L. Sarony-Frye.

784th Meeting, held at the British Museum (Natural History), 17 December 1960

The President, Mr. C. P. Castell, in the chair.

Election of Members

Mrs. Marjorie Farnworth, The Old Vicarage, Lyme Regis, Dorset.
T. Oliver Farnworth, ditto.

Mrs. Christine Olivette Page, The Shell House, Polperro, Cornwall.
William Walter Page, ditto.

Miss Jill Royston, B.Sc., 8 Leyfield, Worcester Park, Surrey.

Christopher C. O. Sergeant, 68 Bedhampton Hill, Havant, Hampshire.

Mrs. B. D. Stephens, Carn Gray House, St. Austell, Cornwall.

Communications

"On the occurrence of *Burtoa nilotica nilotica* (Pfeiffer) in Ethiopia," by T. E. Crowley and T. Pain.

"*Zirfaea crispata* (L.) in Orkney," by R. Rendall.

Exhibits

Special exhibits: Olividae; the armature of land snails. Mr. S. P. Dance gave an address on the latter, illustrated by drawings and specimens, and Mr. T. Pain also exhibited examples. Fossil Olividae from the British Museum collections were exhibited by the President.

Mr. J. Cooper showed a large series of *Unio pictorum* and *Anodonta anatina* from the Serpentine, London.

785th Meeting, held at the British Museum (Natural History), 21 January 1961

The President, Mr. C. P. Castell, in the chair.

Member Elected

Miss Natalie Evans, c/o Barclay's Bank, Cockspur Street, London, S.W.1.

Communications

"Some notes of East African Enidae" and "*Boysia boysii* (Pfeiffer) in Africa," by B. Verdcourt.

"*Viviparus viviparus* (L.) in Ireland," by N. F. McMillan and A. W. Stelfox.

Exhibits

Special exhibit: Volutidae, introduced by Mr. T. E. Crowley. Examples were shown by the President, Mr. L. Sarony-Frye and Mr. R. P. Scase. Mr. S. P. Dance exhibited the type specimens of *Voluta aulica* Sowerby, *V. pulchra* Sowerby and *V. fulgetrum* Sowerby, from the British Museum collections. Mr. T. Pain exhibited examples of all the described species of *Pollicaria*. The following were sent by Mrs. S. M. Turk: a carinate abnormality of *Helix aspersa*, labelled "*Helix Paullina*," Newquay (see *J. Roy. Instit. Cornwall*, **17**, 327), and a dead shell of *Theodoxus fluviatilis*, Falmouth, Mrs. Mary Knocker (probably introduced with ballast), both from Truro Museum; scalariform *Helix nemoralis*, Reskadinnick, Cornwall.

786th (Annual) Meeting, held at the British Museum (Natural History), 18 February 1961

The President, Mr. C. P. Castell, in the chair.

Members Elected

Michael William Challis, Department of Zoology, British Museum (Natural History), Cromwell Road, London, S.W.7.

John Cooper, 16 Purrett Road, Plumstead, London, S.E.18.

M. J. H. Liversidge, P.O. Box 30047, Nairobi, Kenya.

Election of Scrutineers

Mr. P. Coxhead and Mr. J. F. Peake were elected Scrutineers.

Election of Auditors

Miss M. Maitland Howard and Mr. P. Coxhead were elected auditors.

Annual Reports

The reports of the Council, the Recorders and the Curator were presented and adopted.

Votes of Thanks

Votes of thanks were approved to the Trustees of the British Museum (Natural History) for permitting the Society to hold meetings at the Museum; to the Officers and Council for their work on behalf of the Society; and to Mr. M. Goodchild for editing the *Conchologists' News Letter*.

Presidential Address

The President delivered an address on "Some notes on Mollusca of the London Area."

Election of Officers and Council

The Officers and Council were elected as shown on page 1.

Exhibits

The President : maps, books and specimens to illustrate his address.

Mr. D. Heppell : marine shells from the west coast of Scotland.

Mrs. N. F. McMillan : hybrids between *Lymnaea peregra* and *L. involuta*.

Mr. T. Pain : Mollusca of Lake Mweru, Africa.

Mr. R. P. Scase : shells collected by Staff Surgeon R. W. Coppinger, R.N., during the voyage of H.M.S. *Alert*, 1881-82.

Mr. L. W. Stratton : *Liguus* from Cuba and Florida.

Mr. F. R. Woodward : freshwater mussels with "winged" shells.

Report of the Council

Twenty four members were elected during the year and one reinstated. There were nine resignations and the Society lost four members by death, namely H. H. Bloomer, R. W. Greenish, N. E. Pellow and L. A. W. C. Venmans. This results in a nett gain of twelve, the total membership now being 198 (including five honorary members).

Seven ordinary meetings and an annual meeting have been held at the British Museum (Natural History). Two field meetings were held, one at Thoresby, Notts, 18 April, and one at Box Hill, Surrey, 20 November. Two numbers of the *Journal of Conchology* were published, namely volume 24, No. 11, 16 June and No. 12, 16 December, which concludes the volume. Mr. D. Nutt has ceased to be the Society's agent for sale of the *Journal*. It has been decided to produce a Conchologist's News Letter, the first number of which has been issued.

Curator's Report

I am pleased to report that the rearrangement of the voucher collection has now been virtually completed. Originally the collection was grouped according to vice-counties, in which all species for each vice-county were mixed together. Now, the species are kept separate, and records are kept as to specimens held for each vice-county. There are still some lots to be sorted out, and put into their respective sections.

I am happy to place on record that I have received for the Society's collection during the past year 352 sets of land and freshwater Mollusca. Two members are outstanding for their help, namely Mr. A. E. Ellis and Mr. M. Goodchild. The specimens contributed by Mr. Goodchild number 52, and all relate to the vice-county of West Sussex.

May I once again appeal to members with duplicates to spare to think of our collection, which still has enormous gaps in it.

FRED. H. COZENS.

Recorder's Report: non-marine Mollusca

Since the last report (volume 24, p. 415) the following 18 new records have been authenticated:

- Scilly (1a): *Leucophytia bidentata*, Mrs. S. M. Turk.
- Hants South (11): *Milax budapestensis*, C. C. O. Serjeant.
- Sussex West (13): *Cochlicopa minima*, Kingley Vale, T. Huxley; *Columella edentula*, *Vertigo antivertigo* (vol. 24, p. 432).
- Glamorgan (41): *Cochlicopa minima*, Oxwich, T. Huxley.
- Caernarvon (49): *Cochlicopa minima*, Coed Dolgarrog, T. Huxley.
- Dumfries (72): *Pupilla muscorum*, *Hydrobia ulvae*, Caerlaverock, *Lauria anglica*, banks of Scar Water near Thornhill, T. Huxley.
- Kirkcudbright (73): *Helicella itala*, Rough Island, T. Huxley.
- Wigtown (74): *Segmentina complanata*, L. Mochrum, *Acroloxus lacustris*, White Loch of Myrton, T. Huxley.
- Dunbarton (99): *Planorbis carinatus*, Endrick Bank, T. Huxley.
- Outer Hebrides (110): *Agriolimax agrestis* (page 14).
- Donegal East (119E): *Succinea oblonga*, R. Erne, Ballyshannon, A. W. Stelfox.
- Meath (123): *Succinea oblonga*, near Moyvalley, Boyne Aqueduct, A. W. Stelfox.
- Cork West (147): *Succinea oblonga*, The Gearagh, A. W. Stelfox and R. Welch.

In future specimens for authentication should be sent to Dr. M. P. Kerney, Vasconia, Crown Dale, Upper Norwood, London, S.E.19, or Department of Geology, Imperial College, Prince Consort Road, London, S.W.7. *Succinea*, *Vitrina* and slugs, alive or preserved in alcohol, should be sent as before to Dr. H. E. Quick, Craythorne, 259 Shinfield Road, Reading. *Pisidium* should be sent to Mr. S. P. Dance, Department of Zoology, British Museum (Natural History), Cromwell Road, London, S.W.7.

A.E.E.

Recorder's Report: marine Mollusca

For some time I have been dissatisfied with the Census of marine Mollusca. I have discussed the matter at some length with Mr. D. Heppell, and in particular the definitions of Winckworth's "areas." With Mr. Heppell's permission I have incorporated some of his suggestions in this report, and he has prepared a map showing the suggested modifications of the "areas." [This map was exhibited at the Annual Meeting, together with two of Winckworth's maps.]

When Mr. Winckworth originated the Census of British marine Mollusca he obviously intended it to be run on the same lines as the Census of the non-marine species, which has been so successful. This involves the authentication by the Recorder of all material, and only such authenticated records are accepted. Unfortunately, largely due to lack of workers on the marine species, recording progress was very slow, and to expedite matters Mr. Gardiner (who became Marine Recorder after Mr. Winckworth) invited and accepted lists of species from various localities without seeing the specimens upon which the lists were based. These lists were submitted by well-known workers and were no doubt largely to be relied upon, but the fact remains that the marine Census is not at all the equivalent of the non-marine Census and its records have not the same standing. Yet workers in other fields may be forgiven for assuming that both censuses are equally reliable.

As a tentative basis for further work the following suggestions are submitted :

- 1). Records of Winckworth and Gardiner to be accepted; where Gardiner has noted that he had examined the specimens recorded as found by others these records also to be accepted. I may say here that my own few records are all based on personal inspection.
- 2). All other records to be discarded. This implies no disrespect to other workers, but it is essential to clear the ground.
- 3). Records based upon museum specimens to be accepted when inherently probable and the specimens have been seen by the Recorder.
- 4). Winckworth's division of records into three categories to be used; (a) living; (b) shells only; (c) doubtful records.
- 5). In the case of intertidal species, the vice-county to be quoted as well as the marine area. At the moment I am using Dr. Eales' *Littoral Fauna of Great Britain* as a standard, though it does not contain a complete list.
- 6). A voucher collection to be started.

We have the authenticated records of Winckworth and Gardiner as a good basis for a new Census. As a further contribution I am prepared to go through the British marine material in Liverpool Museums for additional records.

NORA F. McMILLAN.

786th (Annual) Meeting (continued), held at the British Museum (Natural History), 18 March 1961

The President, Mr. C. P. Castell, in the chair.

Statement of Accounts

The Hon. Treasurer, having been prevented by illness from presenting the accounts for the year 1960 on 18 February, presented the audited accounts, which were adopted.

787th Meeting, held at the British Museum (Natural History), 18 March 1961

The President in the chair.

Communications

"*Pisidium cruciatum* Sterki in Michigan," by W. H. Heard.

"*Achatina fulica hamillei* (Petit) in the Kavirondo District of Kenya," by B. Verdcourt.

Exhibits

Special exhibit: Unionidae: introduced by Mr. A. E. Ellis and Dr. M. P. Kerney. Specimens of freshwater mussels were also exhibited by the President (from the British Museum collections), Mr. T. Pain, Mr. L. W. Stratton and Mr. F. R. Woodward. Mr. Pain also exhibited shells to illustrate Dr. Verdcourt's paper.

788th Meeting, held at the British Museum (Natural History), 15 April 1961.

The President, Mr. C. P. Castell, in the chair.

Members Elected

City of Liverpool Public Libraries, William Brown Street, Liverpool 3.

Christopher R. C. Paul, 60 Priory Way, North Harrow, Middlesex.

Edmond M. Venables, Norman's Glade, West Barnham, Bognor Regis, Sussex.

Communication

"*Cepaea nemoralis* (L.) from sand dune deposits at Dog's Bay, Connemara, Galway, Eire," by L. M. Cook and J. F. Peake.

Exhibits

Special exhibit: Buccinidae, introduced by Mr. L. W. Stratton; specimens were also exhibited by the President, and Mrs. Wilkins showed water colour paintings by the late G. L. Wilkins. Other exhibits were: land shells from Madeira, by Mr. G. A. S. Barnacle; giant *Achatina balteata* from Congo, by Mr. T. Pain; shells from South Georgia, by Mr. C. A. Raffray; types of "species" of *Aspatheria* from Egypt described by Bourguignat, 1879, from Musée d'Histoire naturelle, Geneva (all are synonyms of *A. rubens* (Lamarck)), by Mr. F. R. Woodward.

ACCOUNTS FOR THE YEAR ENDING 31 DECEMBER 1960.

Income and Expenditure Account.

Dr.		Cr.	
£	s. d.	£	s. d.
To Annual Subscriptions—		By Publication and Distribution—	
Paid in 1959	18 3 11	Vol. 24, part 10	12 13 0
Arrears	9 0 0	Authors' reprints	148 2 3
Current	160 17 6	Vol. 24, part 11	15 17 6
		Authors' reprints	
Subscribers (non-members)	188 1 5		163 19 9
Sales	83 19 8	Despatch of parts	4 9 4
Sales of donated Journals	74 1 11	Subscriptions and Donations	3 0 0
Dividends and Interest—	7 16 3	Refunds	8 13 5
3½% Defence Bonds	28 0 0	Purchase of old Journals	18 18 6
4½% Defence Bonds	9 0 0	Printing and Stationery	8 17 11
4% Funding Loan	16 6 6	Printing Winckworth addendum	6 10 0
3½% War Stock	1 8 4	Speakers' Expenses	2 2 0
Post Office Savings Bank	21 4 11	Bank Charge	1 1 6
		Officers' Expenses	13 2 11
		Postage	4 3 3
		Balance, being excess of Income over	
		Expenditure carried to Balance	201 7 5
		Sheet	
			£429 19 0

Reserve and Research Fund.

	£	s.	d.		£	s.	d.
To Amount of Fund, 31 December 1959 ..	466	1	2	By Amount of Fund, 31 December 1960 ...	568	1	2
Donations ...	2	0	0				
Bequest from the late H. H. Bloomer ...	100	0	0				
	£568	1	2		£568	1	2

Life Membership Fund.

To Amount of Fund, 31 December 1959 ...	£	s.	d.	By Transfer to Income & Expenditure Account ...	£	s.	d.
„ Dividends and Interest ...	569	14	0	„ Amount of Fund, 31 December 1960 ..	25	0	0
	25	0	0		569	14	0
	£594	14	0		£594	14	0

BALANCE SHEET.

LIABILITIES				ASSETS			
To	£	s.	d.	By	£	s.	d.
Membership fees paid in advance ...	20	14	9	4% Funding Loan (Cost) ...	350	0	0
Subscriptions paid in advance ...	4	0	0	2½% Defence Bonds (Cost) ...	200	0	0
Life Membership Fund ...	569	14	0	3½% War Loan (Cost) ...	40	0	0
Research and Reserve Fund ...	568	1	2	3½% Defence Bonds (Cost) ...	800	0	0
Capital Stock ...	800	0	0				
Balance from Income & Expenditure Account—				Cash—	1390	0	0
As on 1st January 1960 ...	516	17	4	At National Provincial Bank ...	272	14	8
From Income and Expenditure				„ Post Office Savings Bank ...	1013	13	11
Account ...	201	7	5	Secretary ...	3	6	1
				Treasurer ...	1	0	0
	718	4	9				
					1290	14	8
	£2680	14	8				
					£2680	14	8

NOTE.—*Liabilities.* There is an estimated liability of £165 due for the printing of Vol. 24, No. 12.
Assets. In addition to those set out in the above Balance Sheet are stocks of unsold publications.

Audited and found correct.

M. MAITLAND HOWARD } *Auditors.*
S. P. DANCE
21 January 1961.

C. A. RAFFRAY,
Hon. Treasurer.
12 January 1961.

CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

Subscription: £1 per annum.

Entrance fee, 10s.

Meetings are held at the British Museum (Natural History), by permission of the Trustees, at 2.30 p.m., usually on the third Saturday of each month from October to May. Field Meetings are also held.

The Journal of Conchology is issued free to Members. Back numbers are obtainable from the Hon. Secretary.

Special Numbers: *Roebuck Memorial Number*, 1921 (Census of British land and freshwater Mollusca), 5s. *Boycott Memorial Number*, 1951 (Census of the distribution of British non-marine Mollusca), £1. *The British Marine Mollusca*, by R. Winckworth, 1932, 2s. 6d. Ditto, *Additions and Corrections*, 1951, 2s. 3d. All post free. Members receive a discount of 25 per cent.

Further information and nomination forms may be obtained from the Hon. Secretary.

Malacological Society of London

Hon. Sec. : MISS JOYCE E. RIGBY, B.Sc., Ph.D., Department of Biology,
Queen Elizabeth College, Campden Hill Road, London, W.8.

Subscriptions: Ordinary Members £2 per annum or £40 for life.

Entrance for all, 10s. 6d.

Meetings are held in the apartments of the LINNEAN SOCIETY, BURLINGTON HOUSE, PICCADILLY, W.1, on the *Second Friday* in each month from *October to June*.

Proceedings: Three numbers a year are free to all Members.

* * Back Numbers may be obtained on application to the Hon. Sec. Members receive a discount of 20%.

LAND MOLLUSCA OF NORTH AMERICA

(North of Mexico)

By

HENRY A. PILSBRY

Curator of Mollusks, Academy of Natural Sciences of Philadelphia.

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Vol. 2, Part 1.—The families Bulimulidae, Urocoptidae, Cerionidae, Achatinidae, Oleacinidae, Haplotrematidae and Zonitidae. 528 pages, 281 illus. 1946. Price \$7.00.

Vol. 2, Part 2.—The families Limacidae, Endodontidae, Arionidae, Philomycidae, Succineidae, Strobilopsidae, Pupillidae, Valloniidae, Cionellidae, Carychiidae, Veronicellidae, Truncatellidae, Pomatiidae and Helicinidae. 640 pages, 304 illus. 1948. Price \$8.00. Volume 2 complete, \$14.00. Entire set, \$25.00.

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REVISION OF *BULIMUS CARDUCHUS* MARTENS (STYLOMMATOPHORA: ENIDAE)

By LOTHAR FORCART.

Naturhistorisches Museum, Basel.

(Read before the Society, 21 October 1961)

MARTENS (1874, 24, pl. 4, fig. 26) described *Bulimus carduchus* from a single shell, which was found by Hausknecht in 1865 on his expedition to the Near East on behalf of the botanist Boissier of Geneva. As Martens mentioned only "Kurdistan," the exact type locality is unknown. Hausknecht collected this shell on his route: Erbil—Altun Köprü — Kirkuk — Sulaimaniya — Pir Omar Gudrun mountains — Avroman and Shahu mountains — across the Persian province of Ardelan to Sanandaj (Sihna) — mountain route to Kermanshah — Sungur and Dinawer mountains — Hamadan. Martens assigned *Bulimus carduchus* to the group (subgenus) *Petraeus* Albers.

When preparing my monograph (1940) on Turkish Enidae, I received in 1938 the holotype on loan from the Zoological Museum in Berlin. Dr. S. Jaeckel informs me that it is now missing, probably destroyed during the war. It is a repaired shell, which I erroneously described (1940, 165, pl. 2, fig. 30) as synonymous with *Petraeus* (*Petraeus*) *halepensis* (Pfeiffer).

The Rev. H. E. J. Biggs kindly sent me some specimens for examination, which were found alive at Taq-i-Knisht, near Kermanshah, Persia, 5 June 1960. The reproductive organs make it evident that *Bulimus carduchus* is not a species of *Petraeus* but of *Zebrina* Held. The epiphallus (fig. 3, Ep.) of the male copulatory organs has a caecum (Caec.), but passes posteriorly without a flagellum—which is well developed in *Petraeus*—into the vas deferens (Vd.), as in *Zebrina kindermanni* (Pfeiffer): cf. Forcart (1940, 147, fig. 4). The caecum and the posteriorly joining part of the epiphallus have, as in other species of *Zebrina*, internal septa (Sept.). The retractors of the penis (Rp.) and of its appendix (Ra.) unite into a common retractor muscle (R.), which is fixed to the diaphragma. The other reproductive organs are much like those of *Zebrina detrita* (Müller): cf. Forcart (1940, 138, fig. 3). Incidentally, the female organs of the specimen examined contained the parts of a spermatophore (Sp.) which was not inserted in the normal way into the spermatheca, but into the uterus (Ut.) and the female part of the spermoviduct (Ovsp.).

The morphology of the radular teeth is the same as that of *Zebrina detrita*. The lateral teeth grade into the marginal teeth. The central teeth of the specimen examined (Mus. Basle prep. VII-39) are malformed, having double ectocones on one side. The following is the radula formula:

$$\begin{array}{ccccccc} + & 12 & & 14 & & 1 & & 14 & & + & 12 \\ - & \frac{\quad}{2} & M & + & \frac{\quad}{2} & L & + & \frac{\quad}{3(+1)} & C & + & \frac{\quad}{2} & L & + & - & \frac{\quad}{2} & M \end{array}$$

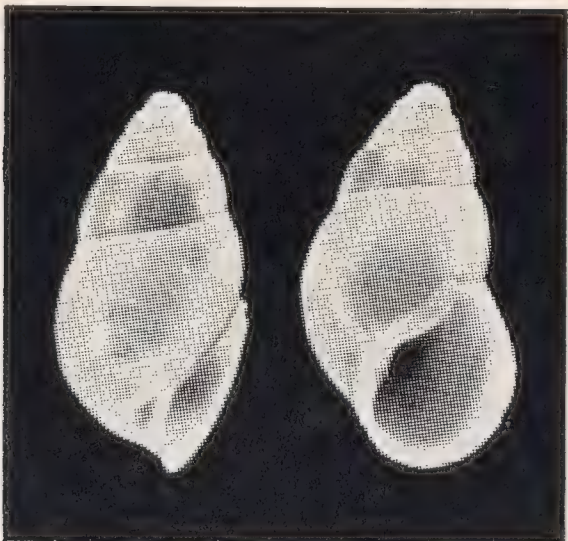


FIG. 1



FIG. 2

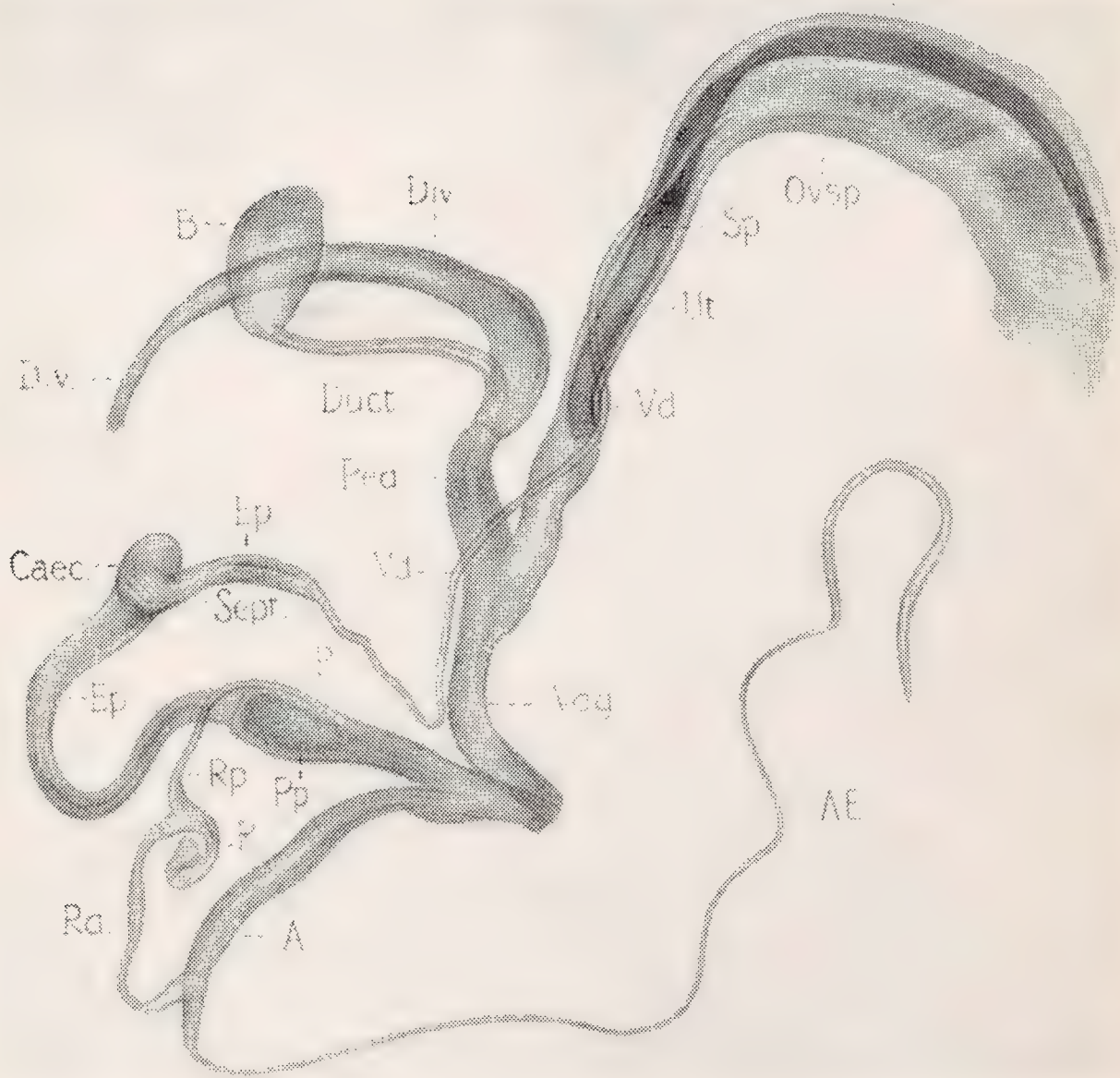


FIG. 3

ZEBRINA CARDUCHA (MARTENS)

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[To face page 54

SYNONYMY

Zebrina carducha (Martens)

Bulimus (*Petraeus*) *carduchus* Martens, 1874: 24, pl. 4, fig. 26. Holotype formerly in Berlin Museum (presumed destroyed). Type locality (restricted): Kermanshah Province, Iran.

Petraeus (*Petraeus*) *halepensis* (Pfeiffer) *partim*. Forcart, 1940: 165, pl. 2, fig. 30.

DISTRIBUTION

Mountains of the Kermanshah Province, Iran.

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EXPLANATION OF PLATE 4.

Zebrina carducha (Martens).

FIG. 1, a, b.—Holotype of *Bulimus carduchus* Martens, 1874, Kurdistan (Berlin Museum), from Forcart (1940, pl. 2, fig. 30), $\times 1\frac{1}{2}$.

FIG. 2.—*Zebrina carducha* (Martens), Taq-i-Kiush, near Kermanshah, Iran (Basel Museum, 6240 a), $\times 1\frac{1}{2}$.

FIG. 3.—Reproductive organs of *Zebrina carducha* (Martens), Taq-i-Kiush (Basel Museum prep. vii-39).

A. sheath of penial appendix	Pp. glans penis
AE. epiphallus of penial appendix	R. common retractor of penis and appendix
B. bursa of spermatheca	Ra. retractor of penial appendix
Caec. caecum of penial epiphallus	Rp. retractor penis
Div. diverticulum of spermatheca	Sept. interior septa of epiphallus
Duct. duct of spermathecal bursa	Sp. spermatophore
Ep. penial epiphallus	Ut. uterus
Ovsp. spermoviduct (<i>partim</i>)	Vag. vagina
P. penial sheath	Vd. vas deferens
Ped. spermathecal duct	

HELIX (CEPAEA) NEMORALIS L. FROM SAND DUNE DEPOSITS AT DOG'S BAY, CONNEMARA, CO. GALWAY, EIRE.

By L. M. Cook, Department of Zoology, University of Leicester,
and

J. F. PEAKE, British Museum (Natural History).

(Read before the Society, 15 April 1961)

In 1958 a survey was made of various living populations of *Helix* (*Cepaea*) *nemoralis* in Co. Sligo, western Ireland (Cook and Peake 1960, and unpublished). As an adjunct to this study it was decided to examine the *Cepaea* found subfossil in the sand dunes at Dog's Bay, Connemara, Co. Galway, since these would provide an interesting comparison with the living populations.

Latham (1865) first drew attention to the heavy specimens of *Helix nemoralis* in a subfossil deposit at Dog's Bay, but the first detailed description of the shells was made by Darbishire (1885). He described a large and high-spined form, which occurred in a black band of soil about two inches thick in a section of a small cliff in the sand dunes

on the west side of the Dog's Bay peninsula. He suggested that the black band indicated the existence at this horizon of a former grass sward. Great changes had occurred in the area by the time of the next recorded visit by Collier and Standen in 1896, who were unable to find the original black band. Instead they found a different dark band which contained smaller shells that were "similar to those existing at present elsewhere." Large specimens occurred in a layer of yellow sand about three inches thick immediately below this zone; they were probably laid down as dead shells collected on the surface of an eroded dune. Since that period rapid erosion has taken place on the peninsula, and in the 1930's Stelfox (personal communication) found very little of the deposit remaining. In 1958 we examined a small section of the dunes exposed on the west side at the northern end of the peninsula. No living *H. nemoralis* were found in the area, although Stelfox had observed a small colony in the south-west corner of the peninsula.

A cross-section of the dune containing two dark bands was examined; the position of these bands relative to those previously recorded is not known. In both of them large *H. nemoralis* occurred, but not in the intervening light-coloured sand. The dark horizons probably represent periods of stability, separated by a mobile phase having conditions similar to those prevailing today. At Dog's Bay the dunes are constantly fluctuating between periods of consolidation and mobility of the sand surface, with the result that successive layers of consolidated material are overlain by drifting sand, and at other times are partially or completely eroded away. The extreme mobility might be due to the absence of the stabilising effect of plants such as Marram (*Ammophila arenaria*). A sample of 66 *H. nemoralis* was collected from the cross-section and from the sand surface where the dune had been eroded.

Previous authors (Latham 1865, Darbishire 1885, Collier & Standen 1896, Kennard & Woodward 1917) have characterised the shells of the Dog's Bay form by:—

- (1) Large size and high elevation.
- (2) A preponderance of shells with a heavy lip folding inwards near the suture.
- (3) Extreme thickness and heavy weight.
- (4) A higher frequency of umbilicate shells than is usual in the British Isles.

The maximum diameter and the height, in the same plane as the spire, have been measured by us in various samples of the Dog's Bay form. Breadth and spire index ($= \text{height/breadth}$) for our sample and examples in the collections of Kennard and Glover are shown in Table 1. The Glover shells are particularly interesting as these are the first individuals known to be collected at Dog's Bay, and probably came from the original black band. They were described by Latham (1865).

TABLE 1. Breadth and spire index (height/breadth) of samples of *H. nemoralis* from Dog's Bay. Measurements in millimetres. The Kennard and Glover specimens are in the British Museum (Natural History).

Collection	Number	Mean and Standard Deviation		Range	
COOK & PEAKE					
Breadth	66	23.63	± 1.08	21.4	— 27.0
Spire Index	66	0.808	± 0.034	0.732	— 0.898
KENNARD					
Breadth	79	23.67	± 1.26	20.4	— 27.5
Spire Index	79	0.823	± 0.042	0.739	— 0.936
GLOVER					
Breadth	20	24.52	± 1.00	22.1	— 26.7

Our sample is both larger and more highly spired than is usual for *H. nemoralis* in Great Britain. There is no significant difference between the breadth of our specimens and those of Kennard ($t = 0.20$, $P > 0.50$), but the mean size of his is slightly greater than ours and significantly smaller than Glover's ($t = 2.43$, $P = 0.02 - 0.01$). The differences may be due to the slight admixture in the later samples between large shells and smaller ones from different horizons. It is also possible that Glover selected large specimens.

At present there is insufficient evidence to determine whether shell size is mainly under genetical or environmental control. Stelfox, however, (personal communication) has bred the large-shelled snails from the Galtee Mountains and found that the offspring reached a size similar to that of the parents. Dr. A. J. Cain (personal communications) has some progeny from pairings of Cantabrian individuals which, although not yet adult, appear to be considerably larger than individuals which are being bred from small-shelled parents under the same conditions. We found no evidence of a high frequency of umbilicate shells. In our sample of 66 only two had a slightly open umbilicus.

It is difficult to treat quantitatively the other characters which have been recorded. The weight of the shells is of little value, as it is impossible to remove all the sand from a shell deposited in a dune, and the weight might also be influenced by mineral deposition after death. There is no doubt, however, that the Dog's Bay shells are extremely thick. Sectioned shells show a deposition of calcareous material up to 2 mm. thick at the second whorl. Kennard and Woodward (1917) gave evidence, including experimental data, for the belief that the shell thickness is closely related to the amount of lime present in the soil. They considered that a foraminiferous sand is more easily assimilated by the animals than other calcareous material, in this way accounting for the frequent occurrence of heavy-shelled

forms near the sea. In their opinion the conditions most favouring the production of heavy shells are the abundance of food, absence of frost (which allows the animals to grow old), and the highly calcareous nature of the soil. The last two requisites were almost certainly present at Dog's Bay.

The lip of the Dog's Bay shells frequently has a slightly abnormal appearance due to a secondary growth on the inner surface which extends to form a double lip. It is probable that this is due to an extension of the layers which are laid down throughout the inner surface of the shell. The infolding of the lip near the suture (Darbishire 1885) does not appear to be more marked than in certain other populations, such as the subfossil one at Mullaghmore, Co. Sligo (Comfort 1945). Both are similarly high-spired, although differing in breadth. Probably the influence of the high spire causes the lip to meet the body whorl rather lower than in more globose shells, thus forming an infolded lip.

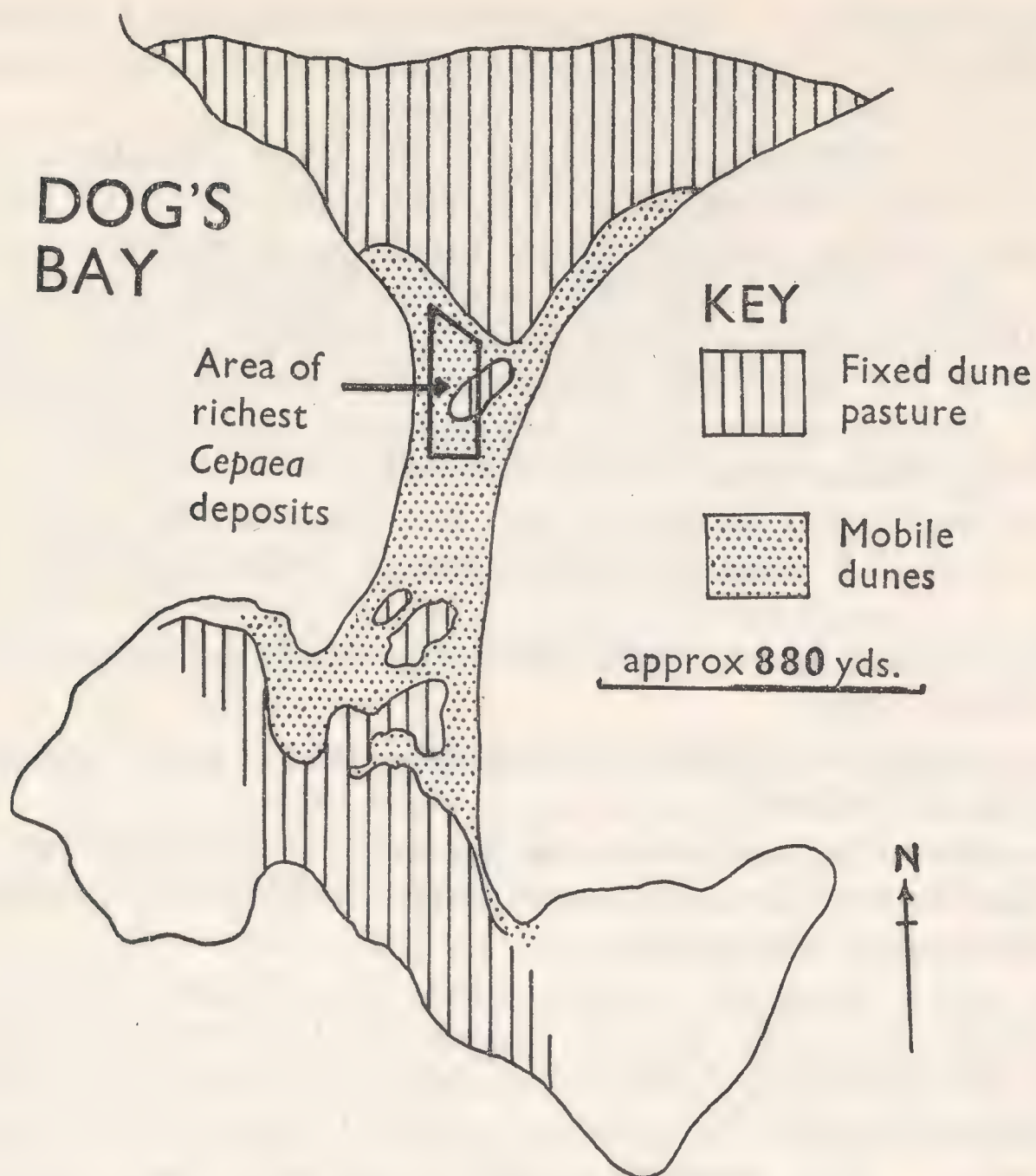
SUMMARY AND CONCLUSIONS.

- (1) The Dog's Bay population is relatively homogeneous, being characterised by the large size, high elevation and extreme thickness of the shells.
- (2) The features of the lip which have been noted previously are probably secondary effects of the height and thickness of the shell.
- (3) The shells are not heavily ribbed and their thickness is possibly an environmental character. This may also be true of shell size, but the genetical evidence available at present suggests that size is to some extent an inherited character in modern large-shelled forms.

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NOTE.—The abbreviations "t" and "P" used in this paper are standard statistical symbols, "t" standing for Student's test, which is a simple significance test, and "P" for the significance level achieved by the data.



MOLLUSCA FROM THE McARTHUR BATH, PORT ELIZABETH, SOUTH AFRICA

By A. C. VAN BRUGGEN, Natal Museum, Pietermaritzburg,
South Africa

(Read before the Society, 16 December 1961)

THE McArthur Bath in Humewood, Port Elizabeth, is a so-called tidal swimming bath. It consists of a large pool of seawater with a constant level and a sloping bottom with a depth of 3-9 feet, built on the beach. It is filled by the high tide washing over the walls, while the level is kept constant by means of overflows in the walls and an outlet valve in the bottom. In the summer season it is emptied and cleaned every second month, but the sand on the bottom is not removed; in the winter season it is left undisturbed for four months (June-September). Once a year, as a rule in September or October, a more thorough cleaning is performed, when the sand that has accumulated on the bottom in the course of a year is removed by bulldozer. Random collecting on these occasions gives an impression of the malacofauna of the bath.

The malacofauna of the McArthur Bath appears to differ to a certain degree from that of the neighbouring intertidal zone on rocks

and sandy beaches. The composition of the fauna is sometimes utterly different at every cleaning operation; even in the same season there are marked differences every year.

The writer collected material for the Port Elizabeth Museum during the annual large scale cleaning operations on 2-4 October 1961. Apart from various juvenile fishes (Soleidae, Atherinidae, Gobiidae, Clinidae and various Sparidae, mainly *Sparodon durbanensis*), a striking free-swimming green compound Ascidian, a fair number of specimens of the sea-urchin *Echinocardium cordatum*, a number of Crustacea and numerous worms belonging to various groups, the following living Mollusca have been collected:

Diodora mutabilis (Sowerby), one specimen on the sandy bottom, length of shell 10.5 mm., the animal mauve with a paler edge around the foot.

Natica genuana Reeve, fairly common, mostly adult specimens, the largest 26 mm. long.

Nassa kraussiana (Dunker), abundant, many shells covered with *Hydractinia* cf. *kaffraria*.

Philine aperta (L.), numerous on the sand, largest specimen 55 mm. long in alcohol (radula of two specimens checked, very probably most if not all belong to this species).

Agglaja sp., a beautiful chestnut brown snail with the sole of the foot speckled with white, 22 mm. long in alcohol. It proved unidentifiable for the time being; so far only *Agglaja capensis* (Bergh), described s.n. *Doridium capense*, has been recorded from South Africa (i.e. East London). The present specimen does not agree with Bergh's description (1907, 29); it has been deposited in the South African Museum (Cape Town) for future reference. Very probably Macnae's specimen (1957, 371) of the Zwartkops River estuary belongs to the same species.

Hydatina circulata (Martyn), one full-grown specimen, foot brownish with a beautiful sky-blue border.

Akera soluta (Gmelin), common on the sand. This species is widely distributed through the Indian Ocean as far as South Australia. It has been recorded from Durban by Smith (1903, 357). The shells of eighteen specimens have the following measurements: 27 (1), 35 (2), 37 (1), 39 (3), 40 (2), 41 (1), 43 (2), 44 (2), 45 (2), 46 (1), 52 mm. (1). This might indicate that a fair number belong to a single age class.

Lamya capensis (Krauss), two specimens measuring 51 and 37 mm. respectively.

Pinna squamifera Sowerby, a few specimens, all under 100 mm. long.

Lima rotundata Sowerby, one specimen of 21 mm. long, foot bright vermilion, tentacles yellowish orange. Most of the tentacles are thrown off when the animal is preserved and the colours disappear very soon.

Papyridea natalensis (Krauss), abundant in the sand, all collected specimens seem to belong to a single age class with measurements 30-38 x 26-32 mm. and have thin horny shells.

Macra glabrata L., fairly common, measurements 43-60 x 32-46 mm.

Lutraria oblonga Chemnitz, one large specimen of 91 x 43 mm. and a smaller one of 73 x 33 mm.

Tellina gilchristi Sowerby, a few pink juveniles in the sand, largest 11.5 mm. long.

Tellina regularis Smith, one specimen of 9 mm. in the sand together with *T. gilchristi*.

Solen capensis Fischer, one juvenile of 46 mm.

Normally the slug *Bursatella leachii africana* Engel is the commonest among the larger species of Mollusca in the bath; this time no specimens were found.

The tidal fauna of the rocks near the McArthur Bath is characterized by representatives of the genera *Acanthochiton*, *Patella*, *Helcion*, *Monodonta* (*Oxystele*), *Turbo*, *Littorina*, *Thais*, *Burnupena*, *Siphonaria*, *Mytilus* (*Perna*) and *Gryphaea*. Various species of *Bullia* are common on the sandy beaches in between the rocks. During the two-monthly cleanings all walls are whitewashed with lime, thus effectively preventing the establishment in the bath of the above-mentioned rock-dwellers. Of the species listed from the McArthur Bath, *Diodora mutabilis* belongs to the intertidal rock-dwellers (see e.g. Stephenson, Stephenson & Bright, 1938).

According to Macnae (1957) and the False Bay check list (1960) the following species are mud-dwellers: *Nassa kraussiana*, *Lamya capensis*, *Pinna squamifera*, *Papyridea natalensis*, *Tellina gilchristi* and *Solen capensis*. It is interesting to note that *Tellina gilchristi* is really an inhabitant of deep water of up to 50 fathoms (Sowerby, 1908 and False Bay check list, 1960). Species of the genera *Akera* and *Lutraria* and *Bursatella leachii africana* are also known to be mud-dwellers.

On the other hand *Natica genuana*, *Philine aperta*, *Aglaja* sp., *Lima rotundata* and *Macra glabrata* seem to prefer cleaner sand, while some of these species are also found on rocky substrata.

Generally speaking we can say that, while the McArthur Bath superficially looks like a giant and relatively deep tidal pool, the composition of its malacofauna is not such as would normally be expected. In a tidal pool the water is changed completely and with an undisturbed regularity. A closer examination of the McArthur Bath, however, shows that as long as the bottom valve is kept closed, it really acts as a kind of settling tank. Only the surface layer of the water is changed and disturbed at high tide through water splashing in and flowing over. This creates a rather sheltered environment with temperatures slightly higher than the sea and a layer of mud on the surface of the sand; swimmers disturbing this layer are responsible

for creating an environment which is also favourable for species that prefer cleaner sand. It should be mentioned that the sand on the bottom does not dry out during the short two-monthly summer cleanings, but is kept wet both by the splash of the high tide and the water preserved in the thick layer of sand itself.

Another factor that contributes to the establishment of that unusual environment is the absence of predators such as large fish, starfish, etc.; the largest predator available is the snail *Natica genuana*. Small specimens of the genus *Octopus* are only rarely met with in the McArthur Bath.

Many other animals, particularly the worms and sea-urchins, are also mud-dwellers. The general picture of the fauna of the bath is evidently that of an estuary such as that of the Zwartkops River north-east of Port Elizabeth, but with certain restrictions imposed by the artificial conditions.

The age of the animals collected also forms an interesting point of discussion. The maximum age of individuals born in the bath cannot exceed one year, because all life is destroyed during the annual large scale cleaning operations. The population thus consists of immigrants and individuals of one year or under. Entrance to the swimming bath from the sea side is barred by a rock formation and a wall. This combined with the fact that most if not all individuals of some species seem to belong to a single age class gives rise to the thought that some of the collected Mollusca might be one year old at the most. Particularly in bivalves, weight is more important than size for age determination; it is therefore probable that at least the population of *Papyridea natalensis* with their rather uniform but thin shells represents a population of only one year in age, more particularly because rapid growth is likely to occur in a sheltered environment. The same phenomenon might be the case for *Akera soluta* and *Macra glabrata*. It is interesting to note here that a sample of thirteen specimens of *Akera soluta* collected in the McArthur Bath by students of Rhodes University on 11 April 1960 shows the following measurements: 19 (1), 21 (1), 22 (5), 23 (1), 24 (2), 27 (1), 35 (1), 40 mm. (1). Excluding extremes this is an average of 22 mm. in April; the average of the author's sample of October is 41 mm. From this it could be deduced that if the population of *Akera soluta* is only annual, its rate of growth is remarkably uniform all through the year. It must be kept in mind, however, that the two samples belong to different years. Finally it must be stressed that none of these observations goes beyond a hypothesis.

The author is much indebted to Dr. K. H. Barnard of the South African Museum, Cape Town, for his continual help and encouragement.

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PISIDIUM PSEUDOSPHAERIUM FAVRE IN CHESHIRE

By N. F. McMILLAN.

(Read before the Society, 13 January 1962)

Pisidium pseudosphaerium was first recorded in the British Isles by Kuiper (1949), from Pevensey, East Sussex. Dance (1957) collected it in the same region and also near Lewes (1956). The only other British record is from Glastonbury, Somerset, H. Overton, 1906 (Ellis, 1950).

For a number of years I have collected *Pisidium* in Cheshire, and Dr. J. G. J. Kuiper kindly determined the species in 1960. The list includes the following ten species: *P. casertanum* (Poli), *P. personatum* Malm, *P. obtusale* (Lamarck), *P. milium* Held, *P. subtruncatum* Malm, *P. henslowanum* (Sheppard), *P. hibernicum* Westerlund, *P. nitidum* Jenyns, *P. pulchellum* Jenyns and *P. pseudosphaerium* Favre. The last species was obtained from four marl-pits near Bromborough, in the Wirral peninsula, between 1947 and 1955. In two of the pits it was associated with *P. milium*, in another with *P. obtusale*, while in the fourth pit *P. pseudosphaerium* was the only species of *Pisidium* taken. Particulars of the other Mollusca in the marl-pits of the Bromborough district are given in McMillan (1959). An account of the *Pisidium* fauna is in preparation. It is not known how *P. pseudosphaerium* reached the marl-pits, which are artificial, though of considerable antiquity. Presumably it occurs in "natural" habitats in the vicinity.

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MOLLUSCA OF THE IRANIAN PLATEAU—II.

By REV. H. E. J. BIGGS, F.L.S.

(Read before the Society, 16 December 1961)

TWENTY-FOUR years have passed since my first attempt at giving an outline of the molluscan fauna of Persia (Biggs 1937). It was unfortunate, but inevitable if the paper was not to be indefinitely delayed, that some of the species mentioned therein should be recorded as undetermined. In the intervening years I have had much help from other workers, notably Dr. L. Forcart and Dr. E. Binder, to whom I offer my best thanks. Some of the species I have been able to determine myself. In more recent years Dr. Charles Reed of Chicago and his associates, who have been studying archeological problems in north-west Persia, have been collecting living snails from the hillsides on which they have been working. These collections have been placed at my disposal for this paper, for which I offer my best thanks as well. We can look forward to a paper by Dr. Reed on the habitats and ecology of some of these species in the near future. Other small collections from widely scattered localities have come to the Mollusca section of the British Museum, and these having been passed to me for determination are recorded in this paper with the permission of Mr. Norman Tebble.

This widening of our knowledge makes it very desirable that a second paper should be written. We are now getting a clearer picture of the pattern of molluscan life on the plateaux. There are, however, still serious gaps, some areas are completely untouched and from most areas we can say that insufficient material is available. I am referring chiefly to the southern half of the Zagros range from Kermanshah southwards and south-westwards. Collecting by Count Doria in the latter half of the last century, reported on by Issel, and my own journeys (1922-36) were more or less confined to the main lines of communication at the time. In this area even to-day we seem to have only records from around Shiraz, and this means that from there southwards and eastwards on to Baluchistan nothing is known. Of the Seistan border we know practically nothing.

Southern Persia is an important area; somewhere in this stretch of country lies the frontier between the Palaearctic and Oriental regions. At present I would place one part of the line just north of Goreh and Hajjiabad Deraga on the Bandar Abbas-Kerman road. It is about here that the Oriental species of Melaniidae cease and the Palaearctic ones become dominant. I am not, in this present paper, attempting to deal with the Melaniidae; I hope to discuss the family later when more material is available. I should simply like to say now that I have a series of a species of *Melanopsis* from Goreh which forms an extraordinarily interesting catenation. It has at one end a smooth form which approximates to a form of *Melanopsis doriae* Issel; at the other end of the catenation is a ribbed and band-

less form which I have not met elsewhere in Persia and may need a new name. On the other hand it may be an Oriental form which is here on the extreme northern limit of its distribution and has interbred with *doriae*; the whole series was taken from a point where the road crosses a stream and I took them all almost without moving my position.

Then again the distribution of *Hydrobia elata* (Parreyss) Küster may help in deciding where the line should be drawn. It is a very common form in many parts of the plateau but I have no idea where the southern limit of distribution of this Palaearctic species is to be found; I have not taken it south of Kerman. More of this species later.

Another interesting point is that to-day we know of a number of forms which were previously recorded from right up north and are now recorded from much further south. In this category come *Oxychilus komarowi* O. Boettger, *Helix* (*Naegelea*) *salomonica* Naegele, and *Truncatellina strobili* (Gredler). As time goes on I think we shall find that this mountainous desert country has a much richer molluscan fauna than one could have guessed at first from the nature of the terrain. Probably the populations may be found to be small and scattered, for life is a struggle for all snails, and perhaps with little or no interbreeding, but they do maintain a hold and are to be found much further south in the hot dry areas, away from the warm damp habitats further north from which they were originally described.

Helix (*Naegelea*) *salomonica* Naegele.

The material reported on in this paper consists of two populations; firstly 16 examples taken 9 April, 1961 under thorn bushes in the Tang-i-Knisht near Kermanshah, on a hillside after rain on the previous day; the second consists of 26 examples taken in the valley of Qaleh Paswah (Pasaveh on some maps) about 25-30 miles south of Lake Resaiyeh (= Urmia), near the source of the Little Zab River at 4,700 feet altitude. The former were taken by Dr. Charles Reed and his party and the latter by Mr. Kent V. Flannery. The second locality must be very close to Naegele's type locality. Mr. Flannery writes: "they occurred, not on rocky hillsides like our Kermanshah variety, but on the valley floor over a quarter of a mile from the nearest hill. They were collected November 8 at about 10.30 in the morning, temperature about 50 degrees Fahrenheit. The day was sunny, but there had been steady rain during November 4, 5 and 6—the first rain of the winter season. The snails were present in great numbers on some of the *tepes* we were surveying." These are valuable ecological details such as we seldom get from collectors who are not malacologists.

These two populations make interesting comparisons. The Kermanshah population is much smaller than the Resaiyeh population, i.e. average alt. 25.7 mm. x diam. 24.2 mm. compared with average

alt. 27.1 mm. x diam. 27.1 mm. Naegele's original description (Naegele 1899) gives diam. 28.24 mm. The average number of whorls for the shells of the above two populations is 4. In colour too they differ, the northern sample being dark brown with five chestnut bands whereas the southern form is buff with obsolescent bands if any. These two localities are 200 miles apart in a direction south-east along the Zagros Range. It would be interesting to know how much further south-east they continue and if they get progressively smaller as they reach the southern limit of their distribution.

So far as the anatomy is concerned all show the absence of dart-sac and mucous glands which is the generic character given by Hesse in 1918 as the characteristic of the subgenus *Naegelea*. The snails of the northern population have been studied in more detail and Fig. 1 & 2 show the genitalia, drawn more or less as the reproductive organs appear when the body cavity is opened up with as little straightening as possible, hence the contortions of several of the ducts. The differences I should like to point out are between the two retractor muscles and the spermathecae. In one case the penis-retractor muscle is long and strap-like (about 13.5 mm.) and in the other short (about 6 mm.), also strap-like in section but swollen in the middle. The two spermathecae differ very much in size and shape. The average of those examples so far dissected would be about half-way between these two extremes. It is hoped that before long more of this population can be dissected and drawings made so that the extent of the variations may be more exactly known. It is also hoped that this study will have some bearing on the study of the reproductive organs of the members of the genus *Levantina*, some species of which inhabit very much the same localities as *H. salomonica*. Both these genera live under difficult conditions in desert and semi-desert areas. The shells of *Levantina* are highly variable and have been given a considerable number of names both here and in Iraq. This great variety of internal form may also be found in the species and somewhat reduce the value of this as a diagnostic character.

Levantina (Assyrella) diulfensis Mousson.

In 1960 Dr. Charles Reed collected a long series of this species in the Tang-i-Knisht near Kermanshah. The series of live examples received are to be reported on in a subsequent paper devoted to the species of *Levantina* of the Near East. Dr. Reed himself is writing a paper on the living snails, both this and the previously mentioned species, as he observed them living on the hillsides near Kermanshah. It is not proposed to do more now than make a few remarks on the shell and animal.

The average measurements for 38 examples taken at random are diam. 33.7 mm.; alt. 18.9 mm., the average ratio D/A being 1.79. These seem to me to be somewhat larger than those from the type locality (the Caucasus), although Mousson does not give any measure-

ments and his description is very brief. The Kermanshah series are also a little flatter and the shell is thinner than the northern forms. This trend is the opposite from that in *H. salomonica* which, so far as we know at the present, gets smaller the further south it spreads. It may be that here on the borders of Persia and Iraq *L. diulfensis* may interbreed with *kurdistanica*, which is always larger and heavier.

Anatomically this species seems very close to *kurdistanica* and one feature, the flagellum to the penis, is noteworthy. In *diulfensis* it is very twisted, but not that tight "corkscrew" so well depicted in Dr. Quick's drawing (Quick 1959) based on an example collected on the eastern side of Iraq.

Monacha (Monacha) obstructa (Férussac).

I collected three dead shells of this species on the bank of the River Karun on 29 December, 1922, which have been determined by Dr. Forcart. This area is geographically part of the Iraq plain, but politically part of Persia, hence its inclusion in this paper. There is another reason for including the record: it confirms my view that *obstructa* does live in Iraq and not all shells of this form are *schotti* (L. Pfeiffer), as some suggest. Indeed it raises again the question as to whether *schotti* should be made a subspecies of *obstructa* or not.

Helicella millepunctata (O. Boettger).

Most unfortunately I did not preserve any of the animals of all the hundreds of examples of this species I collected in Persia. Had I done so it would have been possible to place this in its correct subgenus, I suggest it should be *Xeropicta* on geographical grounds.

Amongst the many examples I took only one was scalariform, and though young shows a very deeply impressed suture. The specimen is in the British Museum.

Helicella (Xeroplexa) kotschyi (L. Pfeiffer).

The above is, I think, the correct name for the shells referred to in my previous paper as "8. *Helicella (Candidula)* sp."

Helicella (Xeropicta) langloisiana Bourguignat.

This species has already been recorded by Haas (1952) for Khuzistan and Luristan. Dr. Reed collected 14 dead examples and 5 living ones in the Tang-i-Knisht, Kermanshah in April 1950, at a height of about 4,500 feet. This record extends the range of the species (originally described from near the Dead Sea) in Persia further northwards along the Zagros Range. The record by Dr. Haas is from the Dizful-Shushtar road which, though politically in Persia, is geographically on the Iraq plain. It seems this species is equally at home at sea level and at over 4,000 feet in the mountains.

Oxychilus komarowi (O. Boettger).

In the Tang-i-Knisht Dr. Reed found four dead shells of this species, 5 June, 1960. Only one example is apparently fully grown and it fits exactly Boettger's description (Boettger 1881) and his figure on plate 7 of that paper. The measurements of my one adult are diam. 7.5 mm. alt. 3.0 mm., a fraction of a millimetre less than in the description. The number of whorls is also slightly less. The species was described from localities on the coast of the Black Sea.

Patula biggsi (Schlesch).

It was always a puzzle to me why this species was placed in the genus *Cyclotus*. Since my 1937 paper topotypes have been sent to two leading malacologists in Europe, who have allocated it to the genera *Patula* and *Pyramidula*. I cannot remember ever having seen an operculum in any specimen I cleaned. So far I have failed to find anyone willing to collect more examples for me so that the anatomy can be examined. The type locality remains the only one known.

In the course of conversation Dr. Georg Haas of the Hebrew University of Jerusalem informed me that in the Valley of Hinnom near Jerusalem, *Pyramidula heirosolymitana* (Bourguignat) is active only for a few months in late winter and early spring, when it feeds on lichens which flourish at the time, and then it returns to aestivation again. Also, he said, when it appears it is covered with dirt. These two facts are equally true of *Patula biggsi*.

Zootecus insularis (Ehrenberg).

In November, 1931, I found two dead shells of this species on the beach at Bandar Abbas, but did not record them in my 1937 paper, under the impression that they might have been brought in with ballast from India. However this species has already been recorded for the interior of Baluchistan, and there are large numbers in the British Museum from Las Bela State in Baluchistan collected 19 March, 1879. It has also been recorded from Muskat and Oman to the west of this locality, where Dr. Jayakar collected it, his specimens now being in the British Museum. It may well be that *insularis* also occurs on the lower slopes of the mountains behind Bandar Abbas.

Ceciloides acicula (Müller).

One example found in a dead shell of *Melanopsis doriae* Issel, from the debris by a stream at Nain, 28 March, 1928.

Ceciloides minuta (Mousson).

Six examples found buried in clods of earth around palm trees at Shahdad (= Khabis), determined by Dr. Forcart. This is a correction of the naming of species 22 on my previous list.

Vallonia pulchella (Müller).

Twelve examples taken in a valley above Seguch, near Kerman, 5 July, 1932, determined by Dr. Forcart.

Jaminia (Euchondrus) continens carmanica (Forcart).

This is the determination of No. 13 on my former list; it was described by Dr. Forcart in this *Journal* (Vol. 24, p. 316).

Jaminia (Euchondrus) albula (Mousson).

A series of over 20 examples were collected by Dr. Reed in Tang-i-Knisht, 5 June, 1960, and five live shells in the same locality 9 April, 1960. I am temporarily referring these to *albula* Mousson on conchological grounds, but until more material is available the true status will not be determinable. Mousson described it as a variety of *septemdentata* Roth. The situation with regard to these closely related species of *Jaminia* in the Near East is complicated. We know of isolated populations. For example Haas (1952) records this species for Persepolis (near Shiraz), a very long way south of the habitat discovered by Dr. Reed. Are there any in between? Is the distribution continuous or are there just isolated populations?

Turanena herzi (O. Boettger).

One example taken on the site of the excavations in Tang-i-Knisht at a height of 4,500 feet, unfortunately a dead shell. The type locality is Ajami in the north-east of Iraq much further north.

Zebrina carducha (Martens).

The correct taxonomic position of this species has been determined by Dr. Forcart (1962) on the anatomy. The examples used were collected in Tang-i-Knisht and two series are available, several living snails collected 9 April, 1960, and a much longer series, nine of which are in my collection, of dead shells taken 5 June, 1960. It would seem that this species is, at present, very rare in collections.

Buliminus (Buliminus) egregius Naeglele.

Three living examples collected by Mr. Kent Flannery of Chicago, who sends the following note: "from high up on a mountain talus slope near Tang-i-Knisht 15 km. from Kermanshah. Collected April 17th at 9.00 a.m. after a rainy night. Temp. ca. 12° C." One can only hope that future collectors in this area will be equally generous in the supply of details on environment and conditions. This species was also recorded by Haas (1952), but in this case the localities are near the present record. Eight dead shells were taken in the same area 5 June, 1960.

Chondrula lamelliferus (Rossmässler).

One example collected by Mr. E. S. Brown at Teheran, 26 February, 1958, at a height of 5,600 feet. This specimen is now in the British Museum.

Truncatellina strobili (Gredler).

One example under a bush in a valley above Seguch, south of Kerman, 5 July, 1932. Dr. Forcart in his paper on the Mollusca of Mazanderan (1935) records it for the coastal plain between the Caspian Sea and the foothills of the Iranian Plateau. He also stated that the general distribution is southern Europe and the Caucasus, together with the south of the Caspian Sea. This discovery considerably extends its range, and is the southernmost point at which it has been taken so far. The height of the Seguch locality is about 7,500 feet. Not having found another example in my duplicates of closely similar species, I assume it is rare in south Persia, as one would expect when a species approaches the southern limit of the Palaearctic region.

Afroplanorbis ? intermixus (Mousson).

I am indebted to Dr. Forcart for this interesting suggestion for the identity of species No. 38 on my previous paper.

Lymnaea (Radix) balthica attica Roth.

It is now suggested that this name should be used for species No. 35 of my former paper. All *Lymnaea* collected by me in Persia were determined by Tomlin before the publication of Dr. Hubendick's great work. I feel that at the present one can only give the names which have been applied to specimens taken in Persia, and leave future workers to say which samples should have certain names attached to them. To the above name have been referred the following examples:—(1) Hajjiabad, on the Bandar Abbas—Kerman road, 2 examples, 6 November, 1931. (2) Kush Ku, near Kerman, 7 examples from a small stream. (3) Taherabad near Kerman, 18 January, 1932, 14 examples in a qanat. (4) Jelalabad, near Kerman, 29 February, 1932, 17 examples in a stream. (5) Shalamzar, west of Isfahan, 15, November, 1922, one example.

Hydrobia (Hydrobia) elata (Küster).

On my previous list I gave only one *Hydrobia*, species No. 30, one example taken at Nain. This example and many other examples are now recorded as *elata*. The total available material for study is as follows: Chah-i-Noh, north of Aqda, 5 December, 1931, 7 examples; Aqda, 5 December, 1931, 11 examples; Erjenun, 1 December, 1931, 7 examples; Taherabad, near Kerman, 18 January, 1932, 18 examples; irrigation canal in Isfahan, August, 1932, 2 dead shells; Nain, 28 March, 1928, 9 examples, and very many found in a box of *Melanopsis doriae* collected at random at Nain and set aside for later study, most being probably alive when taken; pond at Bambiz, south of Nain, 5 December, 1931, one dead shell. There are also 2 specimens in the British Museum received from Parreyss in 1846 collected near Shiraz, and 5 examples labelled in his own hand writing "*elata* Parr.

Persepolis." The first mentioned specimens have his label "*Paludina elata*" on the tablet. Mr. E. S. Brown collected one example of this species, 24 November, 1960, from the Bendarmir River near Shiraz, by chance with a series of *Melanopsis doriae*. Parreyss' MS. name was validated by Küster and so must be attributed to him. From the above records it is clear that the species is widespread in Persia, both on the central plain and in the Zagros mountains. It would be interesting to know how much further south than Kerman it is to be found; I found no trace of it on the Bandar Abbas—Kerman Road. This is not for lack of searching, for I have fresh-water species from very many points along this road.

Melanopsis doriae Issel.

Whilst being all in favour of reducing the names given to forms of this already over described genus, the species found on the Iranian Plateau is quite distinct and there are certain specific characters which never vary and qualify the form to full specific rank. It is not a geographical race or subspecies.

While being reluctant to add more names to the list, one has to have names for forms in order to be precise when discussing the ecological problems, which I hope to do in a later paper: *pallida* ssp. nov. Size and shape much the same as typical *M. doriae* Issel found generally on the plateau, but the coloured bands are missing in the subspecies and the colour is uniformly sandy yellow. The type specimen (now in the British Museum) measures 17.6 x 7.2 mm. The locality is Bagh-i-Zerisf near Kerman, where all the examples taken in the qanat are of the proposed subspecies. There are 4 paratypes in my collection. In a long series of the species from Nain quite a number may be referred to this subspecies. From Agda also I have a series grading from the normal coloration to a cream-coloured example. Qanats being closed irrigation systems, inbreeding is inevitable with little chance of the introduction of individuals from other populations. This isolation leads naturally to the rise of subspecies.

Pseudamnicola ? *raddi* O. Boettger.

A large number of examples of *Melanopsis doriae* were taken by a Persian boy at Nain, 28 March, 1928, and set aside for examination later. Only recently worked through, this collection has yielded quite a good number of this species.

Pisidium casertanum (Poli).

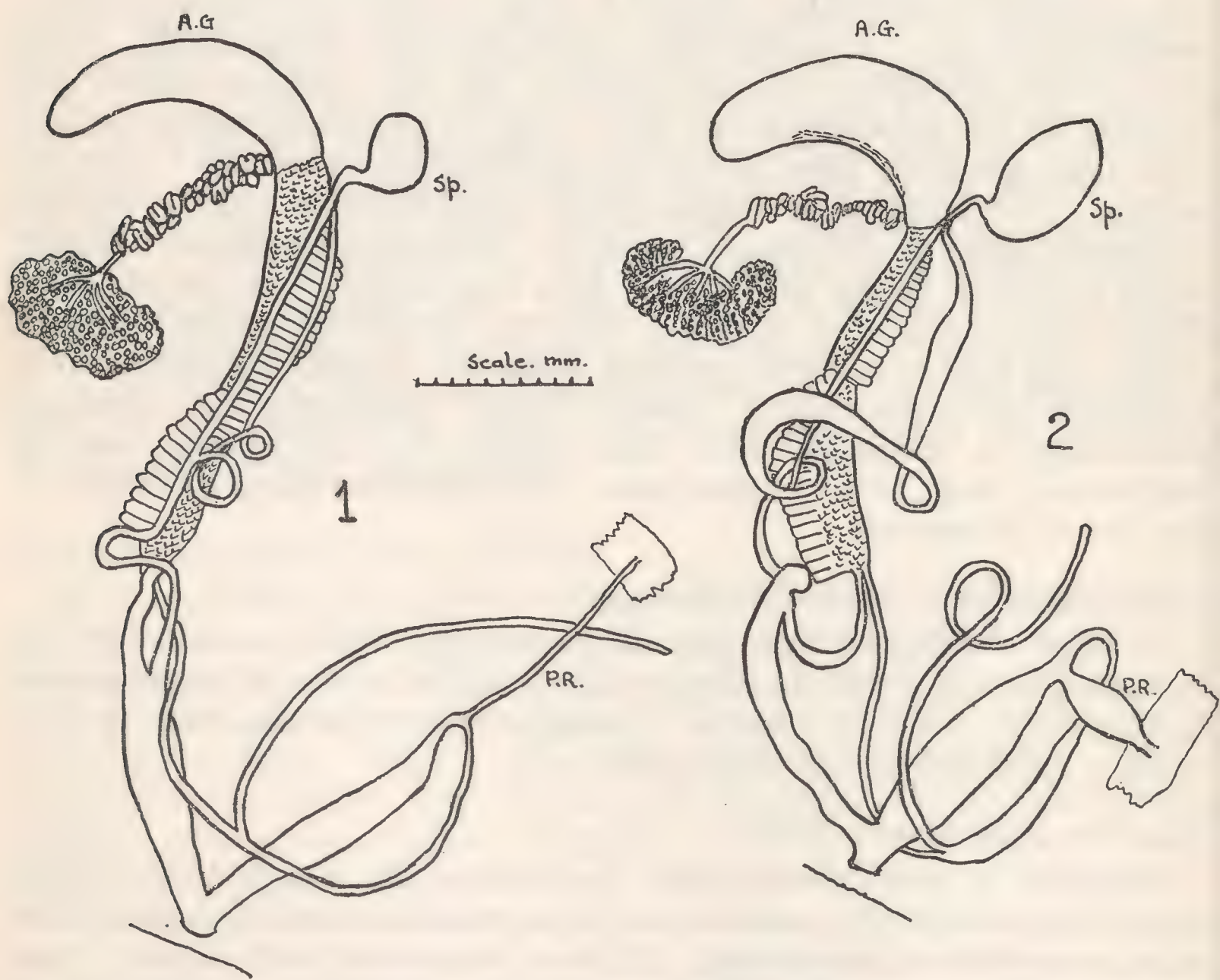
Plentiful in a roadside ditch in Isfahan, 21 April, 1934. This road is now a fine big avenue and it is probable that this habitat has now completely disappeared. Eleven examples were taken in a stream at Langar, south of Kerman, 25 March, 1924, and three found in a stream at Seguch in July, 1932. I am grateful to Mr. Dance for determining these specimens.

Sphaerium lacustre (Müller).

Two examples taken south of Resht, Gilan Province, 12 September, 1927, which may be a variety. I record them here as the species is not mentioned in Forcart's 1935 list, and this may be a first record for Persia of the species. I have not found it on the plateau itself.

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Helix (*Naegelea*) *salomonica* Naegele. Fig. 1. Example 831/M. Fig. 2. Example 831/K. Persia, 1961. A. G. albumen gland. P.R. penial retractor muscle. Sp. spermatheca.

THE AFRICAN FRESHWATER BIVALVE *ASPATHARIA* (*SPATHOPSIS*) *RUBENS* (LAMARCK), ITS SYNONYMY AND DISTRIBUTION

By T. PAIN and F. R. WOODWARD

(Read before the Society, 18 November 1961)

It is perhaps to be expected that this, one of the largest and most widely distributed of all freshwater mussels of tropical Africa, should have been described on numerous occasions as a new species. It varies very considerably in form, shell thickness, and in the colour of the periostracum and interior of the valves, so that without a large series from many localities available for comparison, it is understandable that many of its more extreme variations should, when seen alone, have been considered as entirely separate species and published as such. Through the kindness of Prof. P. L. G. Benoit, the senior author has been privileged to examine the very large series preserved in the collection of the Musée Royal de l'Afrique Centrale at Tervuren, in addition to which we have, through the generosity of the Rev. H. E. J. Biggs, had on loan for study a fine series of *A. rubens* obtained by him in the Nile delta, as well as material from a number of localities formerly in the collection of the late Major M. K. Connolly and now in the senior author's possession. A careful study of all this material has convinced us that but one species exists, in spite of the considerable variation shown, and that the oldest name available for it is that of Lamarck.

As pointed out by de Beaufort (1951, 109), communication between the great African freshwater basins must have been easier in former times. Many species of fish and freshwater molluscs are common to the Niger, the Chad basin, the Nile and the Congo and several extend their range to the great eastern African lakes. Some of the freshwater mussels extend from the Niger to the White Nile, with aberrant forms in the eastern African lakes. Haas and Schwarz (1913) give evidence that lakes Timbuctoo and Chad, Lake Leopold II and others in the Congo basin, and Lake Ngami in South Africa all are the remains of extensive swamps or lakes. The three northern basins, Timbuctoo, Chad and Congo, were in communication with each other and with the Nile. The southern Ngami basin remained more isolated. This is, in fact, in complete accordance with the present known distribution of *A. rubens*, which occurs in the three former, but is absent from the latter, its place in South Africa being taken by the two quite distinct species, *A. (S.) petersi* (Martens) and *A. (S.) wahlbergi* (Kraus).

Fossil records of *A. rubens* are scanty. It is recorded by Adam (1959, 58) from the Miocene of the Karugamania and from the Kaiso Beds (Pleistocene) of the Semliki, Congo Republic, Adam doubtfully referring his specimens to *wissmanni* (Martens). It also occurs in the Pleistocene of Egypt, in Quaternary deposits around Lake Edward (Adam 1957, 129-130), and in Alluvium in Egypt and the Sudan.

The following synonymy contains the original references to each of

the described species which the authors consider fall within the range of variation of *A. rubens* and to be synonymous with it.

Aspatharia (Spathopsis) rubens (Lamarck)

Anodonta rubens Lamarck, 1819. *Hist. Nat. Anim. sans Vertèbres* **6** (1): 85. (Type locality, Senegal. Based upon pl. 201, figs. 1 a-b, of Bruguière, 1797, *Encyc. Méthod. Vers.* **1**).

„ *arcuta* Cailliaud, 1823. *Voyage à Méroé*, Atlas **2**, pl. 61, figs. 4, 5. Lower Egypt, Canal de Joseph (= *arcuata* Cailliaud of authors).

„ *clappertoni* Koenig, 1826, in Denham and Clapperton, *Narrative of travel and discovery in North and Central Africa*, Appendix, 255.

„ *anataria* de Christofori and Jan, 1832. *Catal. Rer. Nat.* **8** in *Mantissa*, **4**. Egypt.

„ *splendens* de Christofori and Jan, 1832. *Ibid.* Africa.

„ *chaiziana* Rang, 1835. *Nouv. Ann. Mus. Paris*, **4**: 307, pl. 28, figs. 1-3, pl. 29, figs. 1-3. Senegal and Upper Niger.

„ *tawaii* Rang, 1835. *Ibid.* 310.

Margarita (Anodonta) arcuata Lea, 1836. *Synopsis of the Family of Naiades*, 54.

Platiris (Spatha) rubens Lea, 1838. *Synopsis of the Family of Naiades*, 2nd edition, 33, 42.

Iridina solida Anton, 1839. *Verzeichn. Conchyl. Samml.* **16** (without locality).

Spatha baikii Adams, 1866. *Proc. Zool. Soc. Lond.* 447. Niger.

Spatha rubens var. *caillaudi* von Martens, 1866. *Malak. Blätter*, **13**: 9. Nile, Lower Egypt.

„ *lepsii* Jickeli, 1874. *Nova Acta Ac. Nat. cur. Dresden.* **37** (1): 265, pl. 9, fig. 4. Upper Egypt.

„ *marnoi* Jickeli, 1874. *Ibid.* 264, pl. 8, figs. 3a-3c. Bahr-el Seraf, Sudan.

„ *wissmanni* von Martens, 1883. *Seitz. Ber. Ges. Naturf. Fr. Berlin*, 73. Belgian Congo.

„ *bellamyi* Jousseume, 1886. *Bull. Soc. Zool. France*, **11**: 491, pl. 13, figs. 2-2a. Niger.

„ *rochebrunei* Jousseume, 1886. *Ibid.* 494, pl. 14, figs. 1-1a.

„ *trestis* Jousseume, 1886. *Ibid.* 497, pl. 14, figs. 4-4a.

„ *adansoni* Jousseume, 1886. *Ibid.* 498, pl. 14, figs. 4-4a.

„ *corneola* de Rochebrune, 1886. *Bull. Soc. Malacol. France*, **3**: 9. French Congo.

„ *ganciniensis* de Rochebrune, 1886. *Ibid.*

„ *martensi* Sturany, 1894. In O. Baumann, *Durch. Massailand zur Nilquelle*, 308, pl. 25, fig. 39. East of Lake Victoria, Tanganyika Territory.

„ *rotundata* v. Martens, 1897. *Deutsch. Ost. Afr.* **4**, Beschalte Weichthiere, 242. (fig. on 243). Wembere steppe near Nyana, Tanganyika Territory.

- „ *innesi* Pallary, 1903. *Bull. Inst. Egypt.* (4) **3**, 1902 : 97, pl. 2, fig. 2. White Nile.
- Mitriodon martini* de Rochebrune, 1904. *Bull. Mus. Hist. nat. Paris*, 462. Senegal.
- „ *heudeloti* de Rochebrune, 1904. *Ibid.* 463. Senegal.
- „ *falemeensis* de Rochebrune, 1904. *Ibid.*
- Spatha chaiziana* var. *compressa* Germain, 1906. *Bull. Mus. Hist. nat. Paris*, 173. Lake Chad.
- „ *rubens* var. *chudeani* Germain, 1907. *Ibid.* 66. French Equatorial Africa.
- „ *adamsoni* var. *major* Germain, 1917. *Bull. Mus. Hist. nat. Paris*, 517, fig. 5. Dahomey.
- „ *rubens* var. *cailliaudi* Pallary, 1909. *Mém. Inst. Egypt.* **6** : fasc. 1. Catalogue Faune Malacologique d' Egypte, 83, with synonyms : *canaida*, *khedivialis*, *letourneuxi*, *laurenti*, *rostrata* and *elongata*, all attributed to Bourguignat.
- Aspatharia* (*Spathopsis*) *wissmanni bangalorum* Pilsbry & Bequaert, 1927. *Bull. Amer. Mus. Nat. Hist.* **53** : 424, fig. 93. Belgian Congo.
- „ *dautzenbergi* Haas, 1936. *Binnen-Mollusken aus Inner-Afrika. Abh. Senckenberg Naturf. Ges.* **431** : 93, pl. 8, figs. 2a, b.
- Spathopsis rubens* Daget, 1961. *J. Conchyl.* **101**, 63-78.

DISTRIBUTION. West Africa, Senegal (type locality) southwards throughout the Niger and Congo basins, but not from the Zambesi or south thereof. Central Africa, affluents of Lake Tanganyika. Lake Albert. Unknown from Lake Victoria (Mandahl-Barth, 1954) or from Lakes Edward and Kivu (Dartevelle & Schwetz, 1947). East Africa, Egypt and the Sudan, throughout the Nile basin and in Uganda and northern Tanganyika Territory.

THE SHELL.

The shell is solid and elliptical; umbones very slightly or not at all sculptured; left valve having a faint compressed tooth under and in front of the umbo, which fits into a corresponding depression in the right valve; the entire hinge area often covered with longitudinally folded epidermal matter; escutcheon dark, sharply triangular; umbonal cavities shallow with a single, elongate, deep scar in each; two large anterior muscle scars and two posterior ones, the upper small.

Interior of the valves pearly, varying in colour from salmon pink to pale blue, almost white in some specimens; periostracum fibrous, the colour varying from black to olive green.

THE ANIMAL.

In *A. rubens* the palpi are longer than wide, semicircular, attached along the upper edge, not united; mantle margin united behind so that the branchial and anal apertures are closed; on the wider margin the mantle is entirely open; outer branchiae united to the mantle to their extremity; inner the larger, free from the abdominal sacs; foot

tongue-shaped, thick; anal and branchial openings separated by a strong bridge (Troschel).

REMARKS. As noted in the synonymy, Lamarck based his species upon pl. 201, figs. 1a-b of Bruguière, 1797. This figure undoubtedly represents a typical *rubens* and thus becomes the type of Lamarck's species.

Excellent figures of *A. rubens* are given by Pilsbry and Bequaert (1927), under the name *wissmanni* (Martens); whilst recognising a relationship between *wissmanni* and *rubens*, these authors consider that the former was distinct, by reason of its more ponderous shell, consistently white nacre, relatively shorter hinge plate and black periostracum. All these features can however be found amongst typical *rubens*. The magnificent series obtained by the Rev. H. E. J. Biggs in the Nile Delta, north-west of Manouf, Egypt, contains both ponderous and typical forms; specimens with white as well as with red or pink nacre are likewise present.

Examination of the type, a single valve, at Tervuren Museum, of *A. (S.) wissmanni bangalorum* Pilsbry and Bequaert (1927, 424), leaves us in no doubt that it is indistinguishable from typical *rubens*. The periostracum is somewhat more glossy and lighter in colour than is usual in the common Congo form (*wissmanni*), but it appears otherwise identical.

Leloup (1950, 83) gives details of the close relationship between *rubens*, *wissmanni* and *chiaziana* (Rang) and concludes that they are conspecific. Examination of the numerous specimens at Tervuren Museum has convinced us of the correctness of this view. *A. chaiziana* (Rang, 1835) is a comparatively small, thick shelled, rather elongated form, with white or bluish-white nacre, but nevertheless is well within the range of variation of typical *rubens*.

A number of so-called species, have been founded upon dwarf examples of *rubens*, such as *A. (S.) innesi* (Pallary, 1903) and var. *chudeani* (Germain, 1907).

Of the 30 described forms, herein reduced to synonyms of *rubens*, none is at most more than an individual variant, differing only in colour, size, length or thickness of the valves, features in which this widely distributed species is noticeably variable. Extreme local conditions, such as deficiency in calcium, lack of suitable food, impure water and many other causes, tend to produce variants, the true relationship of which can easily be overlooked, unless comparison can be made with a large series of specimens from as many different localities as possible.

We have given particular attention to the species described by Haas (1936) as *A. (S.) dautzenbergi* and are of the opinion that, although it comes from the extreme south-western limit of the geographical range of *rubens*, it is not even sub-specifically distinct. Specimens in the Tervuren Museum, from the Congo, Luapula River at Kashiobwe, in Katanga Province (Stappers) and identified by Haas, do not, so far as we can see, differ except in size and thickness from

typical *rubens*. The periostracum is reddish-brown, the interior of the valves bluish-white. The muscle scars and hinge line are as in the typical form. Small, thick-shelled examples such as this occur in a number of localities throughout the whole area in which the species is found, sometimes in company with more typical shells.

Through the kindness of Dr. E. Binder, we have been able to examine the types of Bourguignat's species of *Spatha* in the collection of the Muséum d'Histoire naturelle de Genève, referred to by Pallary (1909, 83). We can find no reference to any of these in Bourguignat's publications and they may therefore be only MS. names. In any case Pallary was perfectly correct in referring all to the synonymy of *rubens*, of which species they represent various growth stages.

J. Daget (1961, 63) has elevated *Spathopsis* to full generic rank, claiming that differences such as the occurrence of the pallial suture below the branchial opening and the presence of concentric folding in the umbonal region of young shells justifies this. We doubt, however, the advisability of this step, since in our opinion the slight differences do not warrant more than subgeneric distinction. We have therefore retained *Spathopsis* Simpson, 1900, as a subgenus of *Aspatharia* Bourguignat, 1885.

Daget gives some interesting information concerning the ability of *A. rubens* to withstand prolonged desiccation. The shell is hermetically sealed by the close union of the valves, and it can stay in this condition for months. Rang (1835) refers to a similar occurrence amongst *A. rubens* from Senegal.

A. (S.) bellamyi (Jousseume, 1886) is retained by Daget as a separate species on the grounds of its habitat (sand amongst rocks at the base of falls), its longer and heavier shell, with white nacre, which alone, he contends, separates it from *rubens*. Amongst the large series of *A. rubens* we have examined from both the Nile and the Congo are to be found specimens in which the colour of the nacre varies from white to deep rose-colour, shells showing great variation in this respect, and the same can be said of the texture and colour of the periostracum, as well as in the form and thickness of the shell.

Daget's case for the maintenance of *A. (S.) adansoni* (Jousseume, 1886) as a separate species is even less convincing, as specimens of *rubens*, more elongate and with a greenish-yellow to blackish-brown periostracum, are not uncommon in certain localities in the Ubangi River, noticeably at Zoro in the Congo.

In such a polymorphic species, as widely distributed as this, considerable variation, as already suggested, is to be expected, together with special adaptations to particular local ecological conditions. It would seem to us, however, most doubtful if these adaptations are worthy of even subspecific rank.

An interesting observation on the effects of the air on the nacre is recorded by Daget. He states that it can completely lose its normal aspect in shells collected dead, but in fresh shells the colour can be considered as a specific criterion in determining species of *Spathopsis*.

As has so rightly been pointed out by Cain (1954, 108), species have rather frequently in the past been named from only one or two specimens and have since been discovered to be based only on extreme variants, connected with another "species" by all grades of intermediate forms.

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EXPLANATION OF PLATE 5.

Aspatharia (*Spathopsis*) *rubens* (Lamarck): Dimensions 118 x 77 mm. Numan, north-east Nigeria. Photographs by R. F. Cumberland.

POST-GLACIAL MOLLUSCA FROM HAWES WATER, LANCASHIRE, ILLUSTRATING SOME DIFFICULTIES OF INTERPRETATION

By B. W. SPARKS.

(Read before the Society, 17 March 1962)

HAWES Water is a small lake in north-west Lancashire, in that area of low and broken relief developed mainly in Carboniferous Limestone south of the Kent estuary. The lake itself is a remnant of a formerly more extensive one occupying a basin surrounded almost entirely by Carboniferous Limestone. Within this basin are considerable thicknesses of infill and Oldfield (1960) has recently produced a pollen diagram for the upper eight and a half metres of these deposits showing them to cover most of the Post-glacial period. Down to a depth of seven and a half metres this deposit consists of extremely fossiliferous calcareous shell marl, and it seemed that at last it might be possible to get a long Post-glacial succession dated accurately by pollen and so to be able to date some of the trends in Post-glacial mollusc faunas. In point of fact the molluscan fauna of Hawes Water proved, in spite of the long period it covers, to be one of the most monotonous I have ever encountered. The species are listed in Table I.



ASPATHARIA RUBENS (LAMARCK)

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As can be seen the fauna consists of eleven species, of which four dominate and three more are present in significant numbers as accessory species. Only one specimen of one land species, *Vertigo pygmaea*, was found. All the species, except *Segmentina complanata*, have distributions well to the north in Scandinavia and may be regarded as very tolerant climatically. In fact faunas consisting of large numbers of very few species usually seem to indicate conditions climatically or ecologically adverse. Yet, as shown by the pollen zones indicated at the sides of Figures 1 and 2, these monotonous faunas cover the period from immediately after the Late-glacial until well on into Zone VIIb, that is virtually through the whole period of Post-glacial forest development.

No climatic inferences may be drawn from the variations of species or groups of species, but a plot of the percentage frequency of the main species (Figure 1) shows a minimum frequency of *Valvata* and *Bithynia* and a maximum of *Lymnaea* and *Pisidium* in the Atlantic period Zone VIIa. These species with their minima at this level are characteristic of more open and more moving water than *Lymnaea peregra* and the *Pisidium* species, which have a wider range of tolerance of poorer water conditions. This suggestion of the deterioration of Hawes Water as a locality for Mollusca in Zone VIIa is confirmed by plotting the actual numbers of specimens rather than the percentage frequency of the species (Figure 2).

It is probably valuable to plot numbers of specimens when the samples are all of the same size and there are no complex ecological variations. In this instance the samples were obtained by Dr. Donald Walker with a Hiller borer and so are uniform in size, while the lack of variation has already been sufficiently stressed. The number of Mollusca shows a marked minimum in Zone VIIa, while the opposite swing of certain species in percentage frequency at this level is now seen to consist of marked falls in *Valvata* and *Bithynia* and little change in the numbers of *Lymnaea* and *Pisidium*, except a check to their general rise in numbers. It seems, then, that the gradual deterioration of Hawes Water as a locus for Mollusca and its subsequent slow recovery is confirmed, but what this was, except perhaps a spread of vegetation and shallowing of the lake, is difficult to see.

The reasons for the poor faunas are difficult to deduce. This is a hard water lake of reasonable size at a low elevation. The lack of land species may be due to the situation of the boring about fifty five metres from the edge of the basin, but the surrounding limestone should be a good area for Mollusca [cf. the Malham area (Stratton 1956)] and one would normally have expected a certain number to have been washed in and incorporated in the deposit. The small number of aquatic species might be due to the locally adverse conditions or to isolation and the failure of Mollusca to spread here. The first alternative seems unlikely in view of the nature of the lake and of the fact that *Bithynia* and *Valvata* flourished here and not such "slum" dwellers as, for example, *Planorbis leucostoma*, *Aplexa*

TABLE 1.—MOLLUSCA FROM HAWES WATER.

	cms.	767	750	750	700	700	650	650	600	550	550	500	500	450	450	400	350	300	250	200	150	100	50	50	TOTAL
<i>Valvata cristata</i> Müller		1	53	203	121	115	185	163	69	41	8	3	—	3	—	—	—	—	—	—	3	90	113	63	1,231
<i>Valvata piscinalis</i> (Müller)		2	209	425	356	316	273	197	88	74	52	22	26	84	173	203	208	2,708							
<i>Bithynia tentaculata</i> (Linné)		—	—	—	2	20	32	64	24	5	3	3	3	40	32	38	48	321							
<i>Lymnaea peregra</i> (Müller)		1	99	204	309	272	362	309	303	400	294	277	382	482	497	536	267	4,994							
<i>Planorbis laevis</i> Alder		—	—	1	—	2	3	—	—	—	—	—	—	—	—	—	—	6							
<i>Planorbis crista</i> (Linné)		—	2	7	—	—	33	10	—	4	1	—	—	—	1	1	3	62							
<i>Segmentina complanata</i> (Linné)		—	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—	5							
<i>Vertigo pygmaea</i> (Draparnaud)		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—						
<i>Pisidium obtusale</i> (Lamarck)		—	—	—	5	7	9	36	19	—	2	—	2	5	27	16	10	138							
<i>Pisidium milium</i> Held		—	—	—	—	2	2	1	1	—	—	—	—	—	—	—	—	6							
<i>Pisidium nitidum</i> Jenyns		—	1	52	99	177	140	152	224	145	157	164	236	197	255	281	106	2,386							
TOTAL		4	364	894	910	923	1076	892	709	671	517	469	649	811	1075	1189	705	11,858							

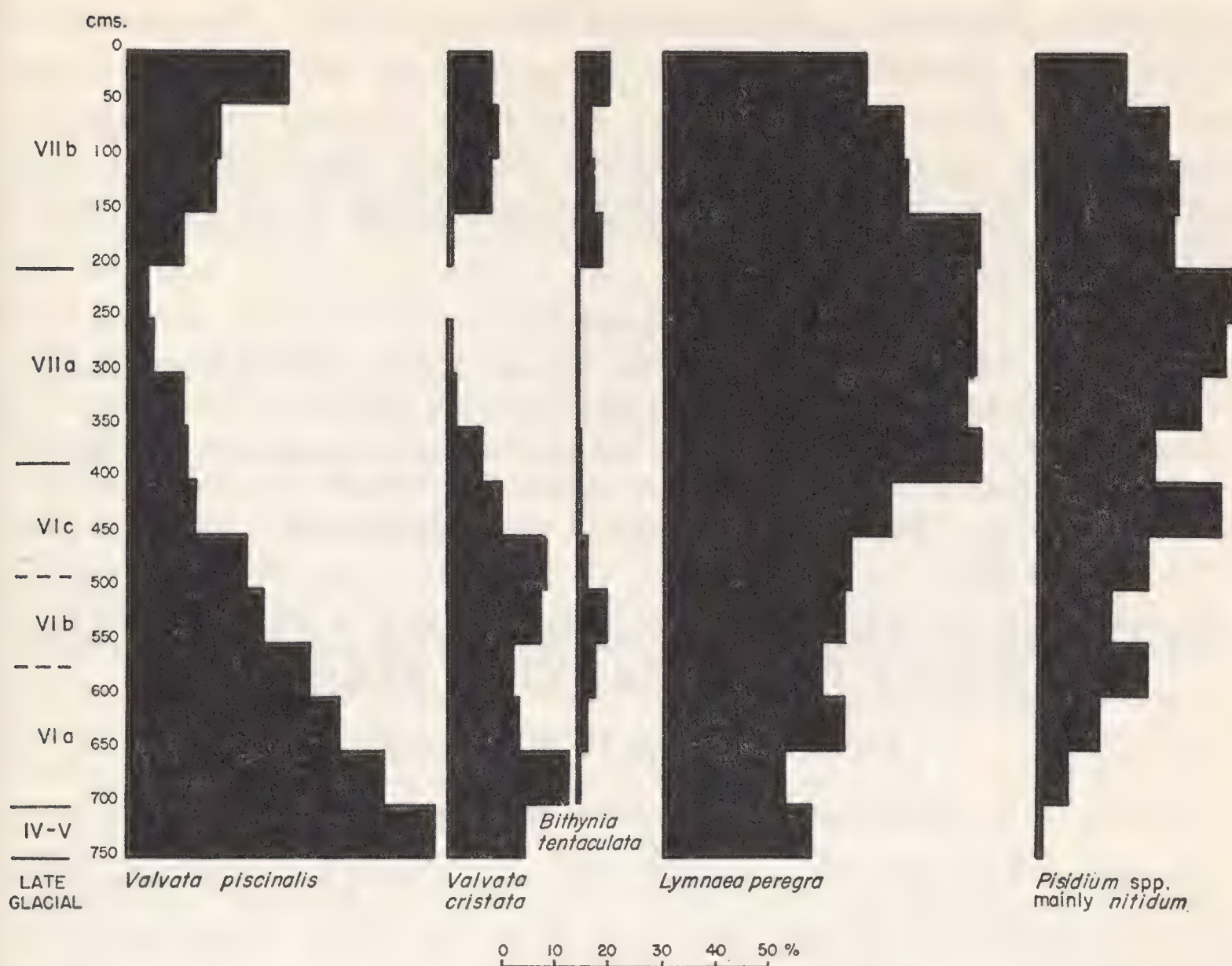


FIG. 1.—Percentage frequency of species of Mollusca at Hawes Water.

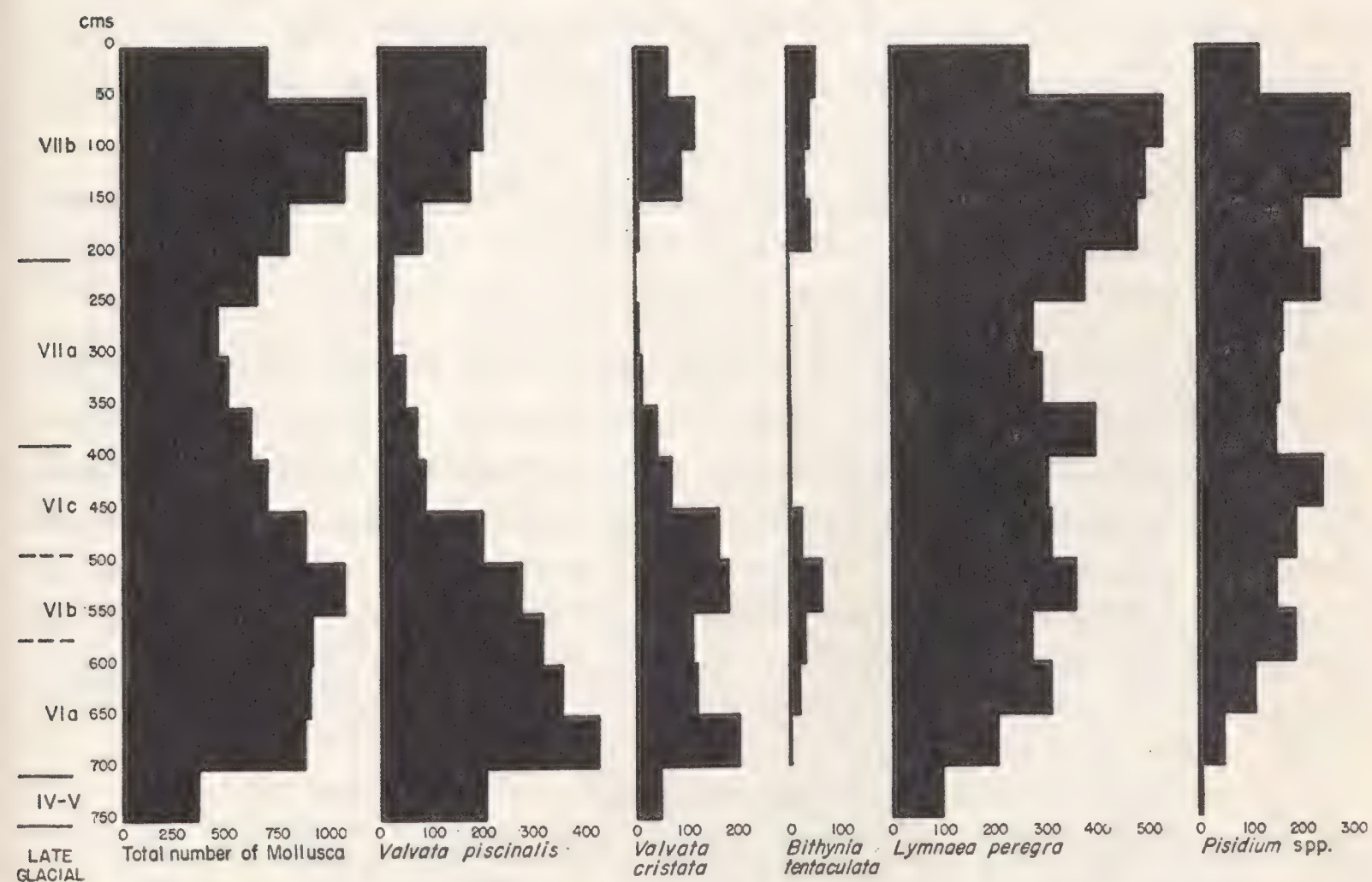


FIG. 2.—Absolute frequency of species of Mollusca at Hawes Water.

hypnorum, *Pisidium casertanum* and *P. personatum*. The second is slightly more plausible. The lake is not part of any major drainage basin and a series of coincidences may have resulted in few species reaching the area. Many isolated localities, however, have rich faunas and one cannot often use isolation alone as an explanation of poor mollusc faunas.

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ON THE OCCURRENCE OF *ACHATINA TAVARESIANA* MORELET IN TANGANYIKA TERRITORY

By T. PAIN and B. VERDCOURT.

(Read before the Society, 13 January 1962)

Achatina (*Achatina*) *tavaresiana* Morelet (1866) was first described from the fortress of Pungo-Andongo, Angola, where it was stated by Welwitsch to occur in great numbers at the edge of the forest. It has since been obtained in the Congo Republic, a number of localities being represented in the considerable series preserved in the Musée Royal de l'Afrique Centrale, Tervuren. We are now able to place on record an extension of its range north-eastward into Tanganyika Territory, a specimen having been obtained by the second Oxford University Tanganyika Expedition, as follows:

Tanganyika: Western Province, Kungwe-Mahari area, Sitete Camp site, litter in thick scrub at head of stream, altitude 4,500 feet, 5 October 1959, J. A. C. Cooke; in the Coryndon Museum, Nairobi.

A. tavaresiana shows considerable variation throughout its range, both in shape and colour, but the noticeably granulose sculpture, which extends from the apex as far as the periphery of the last whorl, is a constant feature of all specimens seen, as also is the average height, about 70 mm., of adult shells. Bequaert (1950, 15) considers *A. studleyi* Melvill & Ponsonby, 1897, and *A. greyi* da Costa, 1907, to be synonyms. Good figures of *A. tavaresiana* are given by Pilsbry (1904).

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OBITUARY

B. S. KISCH, 1882-1961.

BARTHOLD SCHLESINGER KISCH, C.I.E., was born on 25 October 1882, and died suddenly at St. Jean-de-Luz on 25 December 1961. After attending St. Paul's School, London, he went to Exeter College, Oxford, and in 1905 he entered the Indian Civil Service. For some time he was Judge of the Chief Court of Oudh, Lucknow, and from 1933-35 was Puisne Judge of the High Court of Justice, Allahabad. He was Secretary of the Joint House of Lords and House of Commons Committee set up to inquire into the organization and methods of the Central Prisoners of War Committee, and from 1920-28 he was Controller, Local Clearing Office (Enemy Debts) and Administrator of Austrian and Hungarian property in India. In 1906 he married Madeleine Louise Claire, daughter of Henri Joseph Bernard-Antony of Douai. She died in 1956 after having been an invalid for many years. On his retirement he went to live at the picturesque town of St. Jean-de-Luz in the south-west corner of France but, shortly afterwards, on the outbreak of the 1939-45 war, he had to leave his new home and he came to England. When the war was over he returned again to St. Jean-de-Luz and lived there for the rest of his life.

Although he had maintained a keen interest in natural history from childhood, it was not until his return to St. Jean-de-Luz that he could devote much time to its study and, with the exception of one short note on the barnacle *Balanus tulipiformis* Ellis (1958*b*), his writings show that, from the first, he was absorbed in malacology. The Bay of St. Jean-de-Luz offers many inducements to the observant malacologist and he systematically explored every rock, crevice and pool so that it is almost literally true to say that he left no stone unturned. In this way he built up a comprehensive series of hundreds of species, both common and rare, which he mounted with painstaking care on blue cards. He countered any criticism of this old-fashioned curatorial procedure by remarking that visitors, among them the local fishermen, were often impressed by such an attractive display and were sometimes impressed enough to want to make additions to it. Thus he enlisted the aid of the tunny fishers who brought him quantities of specimens dredged in off-shore waters. Sometimes the haul consisted of specimens of the star-fish *Astropecten irregularis* (Pennant), the stomach contents of which presented him with a remarkable array of molluscs, some of which are rare and difficult to obtain by other means (1958*a*). The systematic position and anatomical characters of the prosobranch gastropod *Circulus striatus* (Philippi) were determined from an examination of a living specimen taken from a star-fish gutted by him (see Fretter, *Proc. zool. Soc. Lond.* **126**: 369-381). He was fascinated by the many small or minute species which make up the bulk of the molluscan list of St. Jean-de-Luz, and in their study in the field and at the microscope he showed considerable skill and unlimited patience. By sifting many gatherings of débris

from the beach at nearby Hendaye he obtained the first complete specimen of the puzzling bivalve *Vasconiella jeffreysiana* (P. Fischer), a species described from a single right valve in which there is a peculiar deep indentation on the ventral edge. His complete specimen shows that the left valve has no such indentation (1958c). A second complete specimen was presented by him to the British Museum (Natural History). This important discovery probably pleased him more than any other, though it must have given him a great thrill when, one June day, he came across a colony of the large *Charonia lampas* (L.) among rocks exposed at low spring tide at Socoa, a little village at the western tip of the Bay of St. Jean-de-Luz (1949, 1952a). The writer and his wife had the good fortune to accompany him on a collecting trip to this spot in June 1958 and half-a-dozen specimens were found in a short time. The accompanying photograph was taken on this occasion and shows him, in typical collecting garb, with a specimen in his hand.

Inevitably his researches had brought him into contact with several species described by the Marquis L. de Folin (1817-96) the prominent French malacologist who was largely responsible for organizing the *Travailleur* and *Talisman* deep-sea explorations in the Bay of Biscay and who described many small or minute species, mostly Caecidae and Chemnitzidae. After producing an admirable biography of de Folin (1956a) he proceeded to catalogue all the species described by him and to give indications of the present whereabouts of existing type material. This arduous undertaking resulted in three valuable papers (1959a, 1959b, 1960) which are indispensable to all malacologists who wish to consult original material of de Folin's species. In the course of this work he tried to trace examples of non-marine species described by de Folin and L. Berillon from the Basses Pyrénées. When the writer and his wife accompanied him on a trip to seek out the original localities for some of these species it was fascinating to see how his knowledge of the language, history and geography of the area enabled him to take us to the exact spot each time. Equally fascinating was his performance at the wheel of his small car during these explorations. His habit of driving fast in heavy traffic and slowly on an empty road was exasperating, while his preference for the middle of the road at all times was positively alarming!

The high spot of his year was undoubtedly the September or October meeting of the Conchological Society. On this occasion he would assemble a delightful exhibit of material, based on his own collecting, on which he would discourse in entertaining fashion. Some months before his last proposed visit to England he had a serious fall and broke his thigh. He had made a complete recovery from this accident when the news of his sudden death was announced. It is certain that his departure will be mourned by many who were privileged to know him, and not least by those students of the Mollusca for whom the name of Barthold Schlesinger Kisch conjures up memories of a most kind, intelligent, entertaining and lovable gentleman.



B. S. Heiser

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NEW MOLLUSCAN SPECIFIC NAMES PROPOSED BY B. S. KISCH

- corpulens*, *Turbonilla* (ex de Folin MSS), 1959b, p. 94, fig. 1.
folini, *Caecum* (nom. nov. for *C. eburneum* de Folin, 1886 (non C. B. Adams 1852), 1959c, p. 329.
fulvum, *Caecum* (ex de Folin MSS), 1959a, p. 17, fig. 1.

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 1950a. Growth stages of *Cyclope neritea* (L.). *J. Conch.* **23**: 108, 1 pl.
 1950b. *Odostomia eulimoides* Hanley on *Chlamys varia* (L.). *J. Conch.* **23**: 109.
 1951. Mollusca of the Biarritz Aquarium filter basin. *Proc. malac. Soc. Lond.* **29**: 8-13, 44, 2 pls.
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 1953a. On *Parastrophia asturiana* de Folin. *J. Conch.* **23**: 330-332, 1 pl.
 1953b. *Pseudomelampus exiguus*, Lowe, sur la côte basque. *J. Conchyl.* **93**: 87-94, 1 pl.
 1956a. L. de Folin (1817-1896). *J. Conchyl.* **96**: 138-152, portr.
 1956b. Les mollusques du bassin filtrant de l'Aquarium de Biarritz. *Bull. Cent. Etud. Rech. sci. Biarritz* **1**: 41-49, 1 pl.
 1958a. *Astropecten irregularis* précieux auxiliaire du malacologiste. *Bull. Cent. Etud. Rech. sci. Biarritz* **2**: 9-15, 2 pls.
 1958b. *Balanus tulipiformis* Ellis on the Atlantic coast of France and an unusual situation for *B. amphitrite* Darwin. *Nature* **181**: 206-207.
 1958c. *Vasconiella jeffreysiana* (P. Fischer). *Proc. malac. Soc. Lond.* **33**: 21-24, 1 pl., text figs.
 1958d. *Cantharidus (Jujubinus) strigosus* (Gmelin) espèce nouvelle pour la faune française. *J. Conchyl.* **98**: 165-167.
 1959a. La collection de *Caecidae* du Marquis de Folin au Muséum National d'Histoire Naturelle. Description de *Caecum fulvum* (ex Folin MSS). Catalogue des espèces publiées par de Folin. *J. Conchyl.* **99**: 15-42, text figs.
 1959b. La collection de *Chemnitzidae* du Marquis de Folin au Muséum National d'Histoire Naturelle. Description de *Turbonilla corpulens*. Catalogue des espèces publiées par de Folin. *J. Conchyl.* **99**: 89-112, text fig.
 1959c. *Caecum folini* nom. nov. [for *C. eburneum* de Folin 1886 (non C. B. Adams 1852)]. *J. Conch.* **24**: 329.
 1960. Les mollusques décrits par de Folin—à part les *Caecidae* et *Chemnitzidae*—avec catalogue. *J. Conchyl.* **100**: 137-162.

Papers written in collaboration with others

1957. (with E. Fischer - Piette). Sur la distribution de *Monodonta colubrina* Gould, espèce nouvelle pour la faune française. *J. Conchyl.* **97**: 25-32, map.
 1958. (with P. H. Fischer). Habitacles de Patelles creusés sur le test d'autres Patelles. *J. Conchyl.* **98**: 168-170, 2 pls.

S. P. DANCE.

A NOTE ON M. GUY BABAULT'S SPECIMENS OF *ACHATINA STUHLMANNI* VON MARTENS

By B. VERDCOURT.

(Read before the Society, 13 January 1962)

GERMAIN'S account (1920, 1923) of Babault's rather poor collection of Mollusca, mostly from the Kakamega region of Kenya, is comprised in two quite large volumes. It had always puzzled me that Babault, who spent some time in Kakamega, should have failed to collect the large and conspicuous species *Achatina stuhlmanni* von Martens, which is common in Kakamega Forest (see my records in Pain, 1957). No collector spending even a few hours in the area could fail to find it. On visiting the Laboratoire de Malacologie in Paris in 1959 I discovered the reason for this anomaly. Babault had indeed collected *A. stuhlmanni*, but Germain had misidentified the specimens as *Burtoa nilotica*. Admittedly the shells are worn, but this error is nevertheless surprising, since the specimens concerned are so large, with obvious macroscopic characters.

REFERENCES

- GERMAIN, L., 1920. *Voyage de M. Guy Babault dans l'Afrique Orientale Anglaise: Mollusques* 1.
 GERMAIN, L., 1923. *Ibid.* 2.
 PAIN, T., 1957. On the occurrence of *Achatina stuhlmanni* von Martens in Kenya. *Rev. Zool. Bot. Afr.* 56: 345-348 (appendix by B. VERDCOURT).

REVIEWS

Life in the Sea. Photography: LENNART NILSSON. Text: GÖSTA JÄGERSTEN. London: G. T. Foulis. 1961. Pp. 184; 8 colour plates, 193 half-tones. £2 10s.

THE aim of this picture book is to give the interested layman a view of the littoral invertebrates, though a few photographs of fish are included at the end, and some planktonic organisms are depicted. Professor Jägersten is Director of the Uppsala University Marine Biological Station, Klubban, Fiskebäckskil, where nearly all the work was done. All the photographs are of living specimens and cover practically every major group of marine invertebrates, Protozoa, Sponges, Coelentera, Platyhelminia, Annelida, Crustacea, Pycnogonida, Polyzoa, Echinoderma and Protochordates. The Mollusca are represented by *Doto*, *Littorina*, *Buccinum*, *Odostomia*, *Aeolidia*, *Dendro-notus*, *Limacina*, *Eledone*, *Pecten* and *Chlamys*, and by coloured plates of *Lima*, a scallop being eaten by a starfish, and the eye of *Eledone*. Six pictures (two in colour) give a realistic portrayal of a struggle between a Lesser Octopus and a lobster; to learn the outcome of this Homeric contest, the reader must consult this book.

Considering the difficult nature of the subjects, the photographs are of a high standard, though in many cases the degree of magnifi-

cation seems unnecessarily large. It is difficult to see, however, what many of the organisms depicted will convey to the "interested layman," as the majority are only likely to be familiar to a zoologist. Perhaps these attractive pictures will stimulate the amateur to learn more about these fascinating organisms. To a zoologist they bring back nostalgic memories of blissful days spent shore collecting or in a marine laboratory. Possibly the chief value of this well produced book is to give some conception of what marine organisms really look like when alive, as opposed to the conventionalised textbook diagrams with which most students are only too familiar.

The land snail genus *Amphidromus*. A synoptic catalogue.

FRANK FORTESCUE LAIDLAW and ALAN SOLEM. Fieldiana : Zoology.

Vol. 41, No. 4, pp. 509-677. 1 coloured plate and 40 text-figures.

Chicago Natural History Museum, 1961.

The beautiful and often highly coloured arboreal pulmonate land snails belonging to the genus *Amphidromus* Albers have always been a favourite with collectors, although their identification has often been a matter of much difficulty, mainly through the lack of a modern work of reference, a state of affairs the present work does much to remedy. Although modestly entitled a synoptic catalogue, the authors have really given us much more than this: a complete check-list of all specific and subspecific names which have been applied to the species of *Amphidromus*, together with information on the present location of type specimens and the known distribution is given, and the probable systematic position of the species is discussed. Previous studies are assessed, and details given of the shell, soft parts, ecology and fossil record. This is followed by a detailed account of the species, the geographical distribution, and an alphabetical list of names. Critical or little known species are well illustrated by photographs, conveniently scattered through the text, and there is one excellent coloured plate.

It is difficult to find any criticism that can reasonably be levelled at this work. The statement that the section *Goniodromus* Bülow, typified by *A. buelowi* Fruhstorfer, is probably based upon diseased shells seems to be pure conjecture. In a number of cases the distribution of a species is given as known only from the type collection: it is difficult to see what this ambiguous statement is actually intended to mean, or what bearing it has on geographical distribution.

Used in conjunction with Pilsbry's Monograph of *Amphidromus* (*Manual of Conchology*, vol. 13), as the authors suggest it should be, this work will prove invaluable to all future investigators. It may be mentioned that Dr. Laidlaw is the oldest member of the Conchological Society.

T. PAIN.

The whereabouts of some of the type specimens mentioned in the work reviewed above is explained in the following extract from a letter from Monsieur Jean M. Gaillard, of the Laboratoire de Malacologie, Muséum National d'Histoire Naturelle, Paris: "La collection des types décrits dans le *Journal de Conchyliologie*, dont le catalogue a été publié dans ce Journal (1950, vol. 90, pp. 8 à 23, pp. 65 à 82 et pp. 149 à 179), est actuellement entreposée provisoirement (pour des raisons d'ordre pratique) au Muséum dans le bureau de monsieur le Professeur E. Fischer-Piette. Ceci est d'ailleurs précisé dans le travail dont je vous donne la référence ci-dessus."

Revision of the African Ampullariidae species of the genus

***Pila Röding*, 1798.** T. PAIN. Musée royal de l'Afrique Centrale, Tervuren, Belgique. Annales, serie in 8°. Sciences zoologiques, No. 96. Pp. 1-27 (19 pages of text). 1961.

The work of Mr. Pain on various genera of African land and freshwater Mollusca is well known to readers of this *Journal*, and he is recognized as a specialist on *Pila* (= *Ampullaria*). We have in this volume a comprehensive review of the African species of the genus, together with a number of useful references to literature and a complete record of the distribution of every species and subspecies so far as it is known. Here again in this work we encounter the inevitable process of pruning the names of species and varieties, which represent the fertility of mind of earlier writers. This is no criticism of the valuable work of former authors, by whom forms which appeared to be different were given names. They had not at their disposal, as Mr. Pain has to-day, a sufficient series of linking forms showing the exact relationships of the various forms. Mr. Pain now accepts only seven species, two of which have subspecies, *ovata* (7) and *africana* (2). One of the subspecies of *ovata* is newly proposed by the author, namely *dartevellei*, which is figured on page 17. I understand that if these figures had been lettered A, B and C from left to right, then A and B would be the holotype and C the first paratype in the table just below the illustration.

If one may venture a criticism, it is simply that typographical errors are numerous, particularly the spelling of the well known name Olivier as Oliver so many times and correctly only once or twice. This is an avoidable blemish.

H. E. J. BIGGS.

The Sea Shells of Dar es Salaam. Gastropods. J. F. SPRY.

Tanganyika Notes and Records, No. 56, pp. 1-33, 8 coloured plates. 1961. Price of No. 56, 12s.; price of separate reprint, 6s. 50 cents (6s. 6d.); add 6d. postage. Obtainable from The Tanganyika Society, P.O. Box 511, Dar es Salaam, Tanganyika.

"This is an article by a novice for novices," modestly asserts the author, but it has a wide appeal and truly fills a long felt want. The

project being carried out by the Philadelphia Academy of Natural Sciences on the Mollusca of the Indo-Pacific region is an elaborate scheme of research which it will take many years to complete; Mrs. Kaicher's booklets cover a very wide area and do not include all the common East African species; there is no other publication which covers the same ground as Mr. Spry's. Although the title suggests that it is meant only for the residents of Dar es Salaam, shell collectors from Kismayu to Mikindani will find it of great value and will be able to name at least the more common shells picked up on this coast. This is a practical work, not preoccupied with the vagaries of scientific nomenclature and other details only of interest to specialists. Nearly 300 species are listed, about half of which are figured from the author's excellent water-colour paintings.

Although some species may possibly be misidentified, those who know how very difficult it is to get reliable determinations of our Mollusca will sympathise with the author, who will be grateful for any corrections. This work, which is the only available one on the Gastropods of the East African coast, will be welcomed by all collectors and those interested in the shells of this region. One is grateful to the Tanganyika Society for producing such a useful work, and looks forward to a companion work on the bivalves.

B. VERDCOURT.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

789th Meeting, held at the British Museum (Natural History), 20 May 1961.

The President, Mr. C. P. Castell, in the chair.

Members Elected

Philip Cambridge, 21 Wilson Road, Ely, Cardiff, Glamorgan.

Miss June Chatfield, 63 Marlow Drive, North Cheam, Surrey.

Miss Rosalyn M. Jones, Woodhaven, Towerage Lane, Upper Sands, High Wycombe, Bucks.

William Lee Lander, 160 Heene Road, Worthing, Sussex; also Survey Directorate Headquarters, Middle East Command (Aden), British Forces Post Office 69.

Miss Janet Moule, 41 Brands Hill Avenue, High Wycombe, Bucks.

Norman Tebble, B.Sc., Department of Zoology, British Museum (Natural History), Cromwell Road, London, S.W.7.

Richard K. Wetzel, P.O. Box 24105, Houston 29, Texas, U.S.A.

Edward Charles Wicks, 11 Park Avenue, Uitenhage, South Africa.

Exhibits

Special exhibit: Mollusca of the Mediterranean region, introduced by the Rev. H. E. J. Biggs.

Mr. S. P. Dance: *Gyrina gigantea* (Lamarck) from all the known localities.

Mr. T. Pain: Ethiopian freshwater Mollusca from the Lower Nile Valley.

Mr. L. W. Stratton: Cowries from Stradbroke Island, Queensland.

790th Meeting, held at the British Museum (Natural History), 21 October 1961.

The President, Mr. C. P. Castell, in the chair.

Communications

"Revision of *Bulimus carduchus* von Martens," by Dr. L. Forcart.

"*Cypraea microdon* Gray: a rare East African cowry," by M. J. H. Liversidge.

Dr. M. P. Kerney outlined proposals for recording the distribution of non-marine Mollusca based on the 10 kilometre squares of the National Grid Ordnance Survey maps, as adopted by the Botanical Society of the British Isles.

Exhibits

Special exhibit: Acavidae, introduced by Mr. G. A. S. Barnacle; examples were also shown by Mr. T. Pain. Mr. L. W. Stratton showed sets of *Nucella lapillus* which had fed on barnacles or mussels, and Miss M. M. Howard land shells from Palestine. Mr. R. P. Scase exhibited rare cowries, volutes and cones.

791st Meeting, held at the British Museum (Natural History), 18 November 1961.

The President, Mr. C. P. Castell, in the chair.

Members Elected

Mrs. Elsie Bullard, 7 Unwin Street, Canterbury, N.S.W., Australia.
Major Peter Kingsley Earle, Kinnell, Itchen Abbas, Winchester, Hampshire.

James Hurley, 2 Achill Road, Drumcondra, Dublin 9, Eire.

Mrs. W. D. McNally, c/o Arabian American Oil Company, Box 443, Ras Tanura, Dhahran, Saudi Arabia.

Charles W. Pettitt, 2 Normans Parade, Sidcup, Kent.

William Reed, Food & Agriculture Organization, United Nations, P.O. Box 260, Port Sudan, Sudan.

Miss Janet T. Sawyer, B.A., Helen Graham House, 57 Great Russell Street, London, W.C.1.

Communications

"The African freshwater bivalve *Aspatharia* (*Spathopsis*) *rubens* (Lamarck), its synonymy and distribution," by T. Pain and F. R. Woodward.

Mr. L. W. Stratton outlined a revised scheme for recording marine Mollusca in British seas.

Exhibits

Special exhibit: Cardiidae, introduced by Mr. L. W. Stratton; relevant exhibits were also shown by the President, the Rev. H. E. J. Biggs, Mr. S. P. Dance and Mr. D. Heppell. Messrs. Pain and Woodward showed specimens to illustrate their paper, Mrs. N. F. McMillan involute *Lymnaea peregra* bred in captivity, Mr. E. C. Badcock an unusual *Pecten maximus*, Mr. G. W. Pitchford shells from Guernsey, including *Theba pisana* from a number of localities, and water colour paintings of tropical land shells, and Mr. R. P. Scase

Thatcheria mirabilis and some rare cowries, including two specimens of *Cypraea microdon chrysalis* Kiener, Zanzibar; *C. saulae saulae* Gaskoin, Phillipines; *C. saulae nugata* Iredale, Queensland; and *C. saluae jensostergaardi*.

792nd Meeting, held at the British Museum (Natural History), 16 December 1961.

The President, Mr. C. P. Castell, in the chair.

Members Elected

Ronald Matthew Dobson, M.A., Ph.D., Department of Zoology, The University, Glasgow, W.2.

Wladimir Lobato Paraense, M.D., Caixa Postal 2113, Belo Horizonte, Minas Gerais, Brazil.

Communications

"Mollusca on Bunter Sandstone at Liverpool," by Mrs. N. F. McMillan.

"Mollusca from the McArthur Bath, Port Elizabeth," by A. C. van Bruggen.

"Mollusca of the Iranian plateau," by the Rev. H. E. J. Biggs.

Exhibits

Special exhibit: Achatinidae, introduced by Mr. T. Pain.

Fossil Achatinidae from the British Museum collections were exhibited by the President. The Rev. H. E. J. Biggs exhibited specimens to illustrate his communication.

793rd Meeting, held at the British Museum (Natural History), 13 January 1962

The President, Mr. C. P. Castell, in the chair.

Member Deceased

The President reported the death of Mr. B. S. Kisch.

Members Elected

A. C. van Bruggen, Biol. Drs., Natal Museum, Loop Street, Pietermaritzburg, South Africa.

R. S. Benton, Kenya Police, P.O. Box 2594, Mombasa, Kenya.

Communications

"*Pisidium pseudosphaerium* Favre in Cheshire," by Mrs. N. F. McMillan.

"*Achatina tavaresiana* Morelet in Tanganyika Territory," by T. Pain and B. Verdcourt.

"A note on M. Guy Babault's specimens of *Achatina stuhlmanni* von Martens," by B. Verdcourt.

Dr. D. F. McMichael gave a lecture, illustrated by slides, on the land snails of Australia and New Guinea.

Exhibits

Special exhibit: Etheriidae, introduced by Mr. T. Pain. Miss J. Sawyer exhibited a collection of marine shells from New Zealand and Mr. M. J. H. Liversidge a selection of East African cowries.

**794th (Annual) Meeting, held at the British Museum
(Natural History), 17 February 1962.**

The President, Mr. C. P. Castell, in the chair.

Member Deceased

The President reported the death, on 10 January, of Harry Beeston, a life member of the Society who was elected in 1901.

Members Elected

Ian Cassells, 92 Buckstone Terrace, Fairmilehead, Edinburgh 10.

R. J. Cleevely, 6 Hatfield Court, Avenue Crescent, Acton, London W.3.

Election of Scrutineers

Mr. F. H. Cozens and Mr. R. Fresco-Corbu were elected Scrutineers.

Election of Auditors

Mr. P. Coxhead and Miss M. Maitland Howard were re-elected Auditors.

Statement of Accounts

The Hon. Treasurer presented the audited accounts for 1961, which were adopted.

Annual Reports

The reports of the Council, the Recorders of marine and non-marine Mollusca, and the Curator were presented and adopted.

Votes of Thanks

Votes of thanks were approved to the Trustees of the British Museum (Natural History), for permission to the Society to hold meetings in the Museum, and to the Officers and Council for their work on behalf of the Society.

Presidential Address

The President delivered his address on "The contribution of Kennard and Woodward to the history of British non-marine Mollusca," illustrated by books, notebooks, portraits and specimens.

Election of Officers and Council

The Officers and Council were declared elected as shown on page 53.

Exhibits

Mrs. E. M. Crowley : some tropical non-marine shells and miniature paintings of them by Thomas Downs, R.M.S.

Mr. T. E. Crowley : shells from Australia and New Guinea to illustrate Dr. D. F. McMichael's lecture on 13 January.

Mr. S. P. Dance : a priced copy of the *Catalogue of the Portland Museum* (1786), compiled by John Lightfoot, librarian and chaplain to the Duchess; portrait of the second Duchess of Portland, taken from a bust by Rysbrak executed when she was eight years old; some shells formerly in the Portland Museum, now in the British Museum (Natural History).

Mr. D. Heppell : various species of shells which live in or on other shells, from the British Museum collections.

Mr. T. Pain : some exotic land snails and their eggs.

Mr. L. W. Stratton : North American Zonitidae.

Mr. F. R. Woodward : *Iridina spekii* S. P. Woodward, Lake Tanganyika, and *I. ovata* Swainson, Senegal.

Report of the Council

Twenty three members were elected during the year and one member reinstated. Four members have resigned, the names of five have been deleted, and the Society has lost three members by death, namely P. Bartsch, H. Beeston and B. S. Kisch. This results in a gain of twelve, making the total 219, including five honorary and nineteen life members.

Seven ordinary meetings and one annual meeting have been held at the British Museum (Natural History), and there were two field meetings : Walton-on-the-Naze, Essex, 16 April, and Powick, Worcestershire, 20 August.

One number of the *Journal of Conchology* (vol. 25, No. 1, pp. 1-52) was published (14 July). There have been three further issues of the News Letter, which has met with general approval.

The Society brought a legal action against D. Nutt, the former agent, for money owing, and was awarded £220 2s. 7d., inclusive of costs. A heavy claim for arrears of Income Tax alleged to be due was successfully rebutted.

Two sub-committees were set up, one to deal with the recording of marine Mollusca and the other to advise on changes in the rules of the Society. The work of both committees continues and reports have been received.

Curator's Report

The Society's collection continues to grow. During the past year members have presented 82 sets of land and freshwater Mollusca, 65 of which were contributed by Mrs. N. F. McMillan, the majority being from Cheshire. The vice-county for which there is now the largest number of species represented in the voucher collection is Sussex West (13) with 68; the runner-up is Chester (58) with 59 species.

F. H. COZENS.

Recorder's Report: non-marine Mollusca

Only eight new vice-county records have been received since the last Report (vol. 25, page 48). By far the most interesting is that of *Pisidium pseudosphaerium* Favre from Cheshire (see page 63).

Scilly (1a) : *Potamopyrgus jenkinsi*, *Hydrobia ulvae*, *Phytia myosotis*, Porth Hellick Bay, St. Mary's, J. O'N. Millott; *Euconulus fulvus*, Tresco, Mrs. S. M. Turk.

Cambridge : (29) : *Milax budapestensis*, Huntingdon Road, Cambridge, C. B. Goodhart, det. H. E. Quick.

Chester (58) : *Pisidium pseudosphaerium*.

Orkney (111) : *Limax flavus*, Ronaldsay (garden), Mrs. N. F. McMillan, det. H. E. Quick.

Louth (122) : *Cochlicopa lubricella*, Greenore, A. W. Stelfox (Liverpool Public Museums).

The past year has seen the launching of the new scheme for the geographical recording of British non-marine Mollusca, based on the 10 kilometre squares of the National Grid. Records are starting to come in fairly well, but I should be glad to receive help from as many members as possible.

M. P. KERNEY.

Recorder's Report: marine Mollusca

In my Report for 1960 (vol. 25, page 49) I suggested a somewhat drastic overhaul of the current scheme for recording the distribution of British marine Mollusca. A committee, consisting of Mr. L. W. Stratton (chairman), Mr. D. Heppell (secretary) and the Recorder, was appointed to consider a proposed census of the British marine Mollusca. At a meeting held on 22 July 1961 various recommendations were approved, which were presented to the Society at the meeting held on 18 November, when it was agreed to act upon them.

NORA F. McMILLAN.

795th Meeting, held at the British Museum (Natural History), 17 March 1962

The President, Mr. L. W. Stratton, in the chair.

Members Elected

Mrs. Alice Margaret Brockbank, Greenwood, 35 Springhill Park, Lower Penn, Wolverhampton, Staffs.

Christopher St. Maur Dawson, The Choughs, Craster, Alnwick, Northumberland.

S. T. A. Featherstone, 29 Crouch Hall Gardens, Redbourn, Herts.

N. R. Hamilton, B.A., Great Tott Farm, Burwash, Etchingham, Sussex.

Mrs. P. Hamilton, Great Tott Farm, Burwash, Etchingham, Sussex.

Communications

"Post-Glacial Mollusca of Hawes Water, Lancashire," by B. W. Sparks.

"The distribution of *Abida secale* (Drap.) in Britain," by M. P. Kerney.

"Cowries from Diani, Kenya," by M. J. H. Liversidge.

Exhibits

Special exhibit: Strombidae, introduced by Mr. S. P. Dance; examples were also shown by the President and Mr. L. C. Prebble.

Mr. G. A. S. Barnacle: marine and land shells from Malaga, Spain.

Mr. M. J. H. Liversidge: specimens to illustrate his communication.

Mr. T. Pain: *Etheria elliptica* Lamarck and a copy of C. M. Yonge's paper on the species in *Phil. Trans. Roy. Soc. (B)* **244**: 423-458 (1962).

Dr. B. Verdcourt: a holograph letter from E. A. Smith, 18 October 1907, to R. L. Harger, Blantyre, Nyasaland, referring to specimens sent for determination, some of which were described in *Proc. Malac. Soc. Lond.* **8**: 12-15 (1908).

CORRECTION: page 44, line 13: read "Birnie Rocks, Granton."

Dr.

[illegible]

Reserve and Research Fund.

	£	s.	d.		£	s.	d.
To Amount of Fund, 31 December 1960 ...	568	1	2	By Guarantee to First European Malacological Congress, 1962	50	0	0
				Census Expenses	36	0	4
				Amount of Fund, 31 December 1961 ...	482	0	10
					£568	1	2

Life Membership Fund.

	£	s.	d.	£	s.	d.
To Amount of Fund, 31 December 1960 ...	569	14	0	25	0	0
New Life Member ...	20	0	0	589	14	0
Dividends and Interest ...	25	0	0			
	£614	14	0	£614	14	0

BALANCE SHEET.

LIABILITIES				ASSETS			
	£	s.	d.		£	s.	d.
To Membership Fees paid in Advance ...	6	10	0	By 4% Funding Loan (Cost) ...	350	0	0
Subscriptions paid in Advance ...	15	3	0	4½% Defence Bonds (Cost) ...	200	0	0
Life Membership Fund ...	589	14	0	3½% War Stock (Cost) ...	40	0	0
Research and Reserve Fund ...	482	0	10	3½% Defence Bonds (Cost) ...	800	0	0
Capital Stock ...	800	0	0	3% Funding Stock "	81	10	0
Balance from Income & Expenditure Account				5% Treasury Stock "	344	0	0
as on 1 January 1961 ...	718	4	9	4% British Gas Stock "	324	10	0
Add: From Income and Expen- diture Account for 1961 ...	218	10	5	3% Savings Bonds "	143	5	0
					2283	5	0
	936	15	2	Cash:—			
				At National Provincial Bank ...	141	2	7
				At Post Office Savings Bank ...	402	9	4
				In hand—			
				Secretary ...	2	16	1
				Treasurer ...	10	0	0
					546	18	0
	£2830	3	0		£2830	3	0

NOTE.—In addition to the Assets shown above are outstanding Audited and found correct.

M. MAITLAND HOWARD }
P. COXHEAD }
Auditors.
31 January, 1962.

Subscriptions and Stocks of unsold publications.

C. A. RAFFRAY,
Hon. Treasurer.
8 January, 1962.

CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

Subscription: £1 per annum.

Entrance fee, 10s.

Meetings are held at the British Museum (Natural History), by permission of the Trustees, at 2.30 p.m., usually on the third Saturday of each month from October to May. Field Meetings are also held.

The Journal of Conchology is issued free to Members. Back numbers are obtainable from the Hon. Secretary.

Special Numbers: *Roebuck Memorial Number*, 1921 (Census of British land and freshwater Mollusca), 5s. *Boycott Memorial Number*, 1951 (Census of the distribution of British non-marine Mollusca), 10s. *The British Marine Mollusca*, by R. Winckworth, 1932, 2s. 6d. Ditto, *Additions and Corrections*, 1951, 2s. 3d. All post free. Members receive a discount of 50 per cent. and are entitled to receive a free copy of Winckworth's List and the *Additions and Corrections* on application to the Hon. Secretary, enclosing 6d. for postage.

Further information and nomination forms may be obtained from the Hon. Secretary.

Malacological Society of London

Hon. Sec. : MISS JOYCE E. RIGBY, B.Sc., Ph.D., Department of Biology,
Queen Elizabeth College, Campden Hill Road, London, W.8.

Subscriptions: Ordinary Members £2 per annum or £40 for life.

Entrance for all, 10s. 6d.

Meetings are held in the apartments of the LINNEAN SOCIETY, BURLINGTON HOUSE, PICCADILLY, W.1, on the Second Friday in each month from *October to June*.

Proceedings: Three numbers a year are free to all Members.

* * Back Numbers may be obtained on application to the Hon. Sec. Members receive a discount of 20%.

LAND MOLLUSCA OF NORTH AMERICA

(North of Mexico)

By

HENRY A. PILSBRY

Curator of Mollusks, Academy of Natural Sciences of Philadelphia.

THE first comprehensive treatment of the subject in over fifty years. Many previously unpublished observations and descriptions of new genera and species. The 1,166 illustrations (more than 4,000 figures) include important drawings of soft anatomy. Printed on heavy coated paper with illustrations scattered conveniently through the text. The last part contains a catalogue of all species and subspecies treated. The four parts include 2,200 pages.

Vol. 1, Part 1.—The families Helicidae, Helicellidae, Helminthoglyptidae and Camaenidae. 599 pages, 377 illus. 1939. Price \$8.00.

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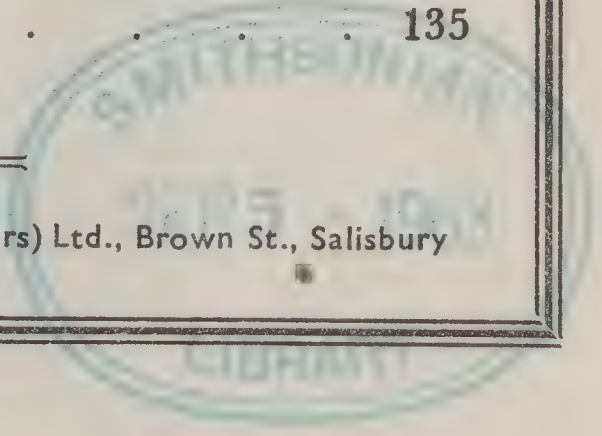
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SOME NOTES ON LONDON'S MOLLUSCS

By C. P. CASTELL

(*Presidential Address, delivered 18 February 1961*)

IN a lecture to the London Natural History Society in 1952 my predecessor, the late Mr. A. G. Davis, stressed the need for a census of the snail fauna of the London Area and thought that, perhaps, a hundred species might occur. Recently I started to accumulate records of the Mollusca of the London Area from published and MS sources and from specimens in the British Museum (Natural History). The following notes are based on this preliminary work.

The practice of the London Natural History Society is here followed in regarding the *London Area*, for natural history recording purposes, as extending 20 miles from St. Paul's Cathedral. This is an area of some 1260 square miles, or about 800,000 acres, and it takes in the whole of Middlesex, the south-west corner of South Essex, the southern part of Hertfordshire, north-east Surrey, north-west Kent and a few square miles of south-east Buckinghamshire. It is thus nearly twice the size of Surrey, twice that of Hertfordshire and five times the size of Middlesex. So, in drawing up any account of the natural history of the area, records relating to six counties have to be consulted.

What literature is available for the Mollusca? The first, and still the only published, list for London, of 89 species, appeared as long ago as 1836 in Daniel Cooper's *A list of the land and fresh-water shells found in the environs of London*, an eight page appendix to his *Flora Metropolitana or Botanical Rambles within thirty miles of London*. Contributors to his list of shells were, in addition to Cooper himself, Thomas Bell, James Carter and Charles Finch. Cooper was a medical student of 19 when the *Flora Metropolitana* was published and he died at the age of 25. Another short list of four pages by Loydell and Kowe appeared in 1883 as a Report of the Lambeth Field Club, but it listed only the species the authors had collected on excursions near London during the previous year. The London Natural History Society has published lists and detailed accounts of the distribution, in its area, of many animal groups, but it has not yet published one for the Mollusca.

The following lists have been published for the Home Counties: Essex — Webb (1897); Middlesex — Cooper and Loydell (1909);

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Hertfordshire — Hopkinson (1884), Stratton (1955); Buckinghamshire — Cooper (1925); Surrey — Pannell (1902, 1903); Kent — Kennard (1929). Kennard's list is part of his presidential address to this Society. The address deals only with land Mollusca, mostly with Post-Glacial occurrences, and he gives merely a bare list of the species recorded as living in Kent. Woodward (1908) states that "The most comprehensive paper is that on the 'Land Mollusca of Kent,' by A. Santer Kennard (*Kent Mag.* 1896, 1: 418)." I have not seen this paper and it is not mentioned in Kennard's MS bibliography of his own papers in the British Museum (Natural History). Horsley (1909) contributes a useful account of the Mollusca of north-west Kent. Lists of species were compiled by B. B. Woodward for the Victoria County Histories: Hertfordshire (1902A), Surrey (1902B), Essex (1903), Buckinghamshire (1905) and Kent (1908). These are very scrappy and little more than bare lists. It is unfortunate that, in view of the apparent relative richness of their molluscan faunas, Surrey and especially Kent, among the Home Counties, should lack adequate accounts.

There was considerable interest in Essex Mollusca 60 or 70 years ago, when two important papers appeared in the *Essex Naturalist*: Crouch (1891A) on the Mollusca of the Becontree Hundred, and Jenkins (1891B) on those of the Thames Estuary.

Science Gossip (1865 - 1902) and *The Zoologist* (1843 - 1916) are useful sources of information. Possibly the most important source of records for the compilation of a county list is the huge set of species notebooks kept by J. W. Taylor and W. D. Roebuck and deposited by the Conchological Society in the British Museum (Natural History). Few records, up to about 50 years ago, even in the most obscure publications, seem to have been overlooked by Taylor and Roebuck. The Society's own census record-books, of which there are over thirty, are also kept in the Museum and should not be forgotten. Among the collections, probably the most important containing London material are those of J. E. Cooper, A. S. Kennard, C. Oldham, B. B. Woodward, and the Society's own collection, all at the British Museum (Natural History).

The London Area is, or has been, surprisingly rich in molluscan species and I have records of some 150, a high proportion of the species likely to occur in south-east England. However, there is little evidence, in print, of much interest being taken in London's Mollusca during the last fifty years. It is not proposed to deal here with all the London species, but to refresh the reader's memory on the historical background and a few other aspects of species especially associated with London.

Pseudamnicola confusa (Frauenfeld) was first recorded, as *Littorina anatina* (Draparnaud), for this country by Gray (1840: 87) who stated that it was "sometimes found in the marshes at Greenwich, with the *Assiminia Grayana*." Jeffreys (1826: 65) describes the habitat as "muddy ditches which are occasionally, but seldom, overflowed by the tide, by the side of the Thames from Greenwich to below Wool-

wich." Reeve (1863: 184) states that Jeffreys procured some specimens in about 1856, when the species was "distributed along the banks of the Thames, from a little below Greenwich Hospital to the upper pier at Woolwich, a distance of about three miles"; it "inhabits muddy ditches and their banks, and it is gregarious." Tate (1872: 266) stated that it was living "on the mud banks beneath the shade of sedges and rushes, skirting the Thames below Greenwich" and that "a number of specimens sufficient to stock every private cabinet in the country may be obtained in a short space of time." About 1872, Marshall (1889: 141) found it in countless thousands at Erith and Abbey Wood and in 1875 at Tilbury. In the Kennard collection there are several caddis cases made of hundreds of shells of this species from Erith. Jenkins and Grocock (1891: 9) regarded the species, which seemed always to have been peculiar in Britain to the Thames marshes, as doomed to speedy extinction. It had "been forced to migrate lower and lower down the river, owing to the pollution of the ditches by various factories, chemical and gas-works, and Thames sewage. As far back as 1883, not even a dead shell could be obtained from " between Greenwich and Woolwich. It appeared to be limited to a single ditch, a few hundred yards long, but the locality was not divulged, "so as not to be instrumental in its extermination as a British species." A dead shell was once taken from a ditch at Beckton and a single living specimen between Erith and Darenth Creek. Kennard and Woodward (1899: 299) considered it extinct by 1899. In 1893 there were still numerous specimens in a small ditch about half a mile west of Erith. Kennard found a single living specimen in 1895, but the ditch became dry and no living example has been found since in the district.

The extinction in the London Area of *Pseudamnicola confusa* is a striking contrast to the success story of *Potamopyrgus jenkinsi* (Smith). This species was first described and named by E. A. Smith in the *Journal of Conchology* in 1889. W. Allen, of Barking Road, Canning Town, a member of the Essex Field Club, sent a few shells from Beckton to a fellow member, W. Crouch, for determination, on 29 January 1889. Crouch took three specimens to Smith of the British Museum on 2 February. He, in turn, sent them to Dr. O. Boettger of Frankfurt, who stated that the species was not known on the Continent and was near to *Hydrobia legrandiana* Brazier from Tasmania. Allen and Crouch, in April, gathered some specimens from brackish water ditches on Beckton Marshes close to the Barking jute factory. A good number were collected at the same locality later in the year and some were sent to Smith (Crouch, 1891A, 1891C, Smith, E. A. 1891).

A. J. Jenkins (1891 A & B), of New Cross, had been studying the Mollusca of the Thames estuary for some years and obtained his first specimens of the new species from ditches on East Greenwich Marshes in 1883. A few shells were found on Plumstead Marshes two or three years later. The East Greenwich colony had died out by 1885,

but by 1889 the species abounded in ditches over Plumstead Marshes, extending from Woolwich Arsenal down to a point midway between Darent Creek and Greenhithe. He, too, sent specimens to Smith and apparently to Marshall. By a strange, if not unfortunate, editorial arrangement, the *Journal of Conchology*, volume 6, contains a description of the same form from Plumstead by Marshall as *Hydrobia ventrosa* var. *carinata*, New Variety, page 140, and *Hydrobia jenkinsi*, New Species, by Smith, page 142. The series of specimens examined by Smith are preserved in the British Museum.

In 1891 letters appeared in *Science Gossip* (W. Crouch, 1891A, W. H. Smith, 1891) expressing disappointment that Allen and Crouch did not receive the credit for finding the new species and suggesting that *alleni* would be a more commendable name than *jenkinsi*. However, Jenkins obviously knew his Hydrobiidae well and he contributed a very useful account of the distribution and habits of the British Hydrobiidae, with the first illustrations of the new species (Jenkins, 1890). He states (1891A : 184) that *jenkinsi* was at one time mistaken for *Pseudamnicola confusa*, owing to that species not being generally known to conchologists, and it was largely distributed to collectors as that species. He points out (1890 : 104) that by far the largest proportion of the shells were carinated; out of 2057 shells from various localities, 1420 proved to be more or less keeled, i.e. about 70%, although 882 shells from one locality on the south bank of the Thames yielded 85% keeled specimens. He kept specimens in aquaria for many months and found that *jenkinsi* appeared to be more hardy and vigorous than *Hydrobia ventrosa* and flourished as well in hard tap-water with pondweed as in brackish water; tap-water was fatal, however, to *H. ventrosa*. Jenkins and Grocock (1891A) state that "*Hydrobia Jenkinsi* is now and for some years is likely to be, the most abundant *Hydrobia* of the Thames marshes." In 1883 it was fairly plentiful in ditches at East Greenwich; "two years later, a few shells were taken at Plumstead, but they were by no means common at that time. They are now extinct between Greenwich and Woolwich, owing to the same cause which forced *H. similis* [*Pseudamnicola confusa*] and *A. grayana* to retreat lower down the river. At certain periods the new species fairly swarm in the ditches of Plumstead Marshes, upon duck-weed, chara and *Enteromorpha intestinalis*."

The earliest records of its spread into freshwater habitats appear to date from 1904, when it was found in a ditch by the side of the river Thames, near Marble Hill, Twickenham, although Cooper and Loydell (1909 : 229) thought it was evidently carried to its new habitat by the overflow of the tide from the lower reaches. This, however, would not explain the choking in 1904 of a four inch water-main in Grumant Road, Peckham, supplied from the Thames at Hampton through a sand filter and the Nunhead reservoirs. About 200 specimens from the pipe were sent to the British Museum, followed in 1905 by some from a high pressure water meter at Wapping and a storage tank in the City of London (E. A. Smith : 1907). Stubbs (1905) collected

numerous specimens from the New River at Hoddesdon, Hertfordshire, in 1905. Stelfox recorded it from Watford in 1907 (Taylor & Roebuck MS), when there was also "a flourishing colony" near Uxbridge (Carpenter and Cooper, 1908). The period of rapid spread of this species from the Thames Estuary to freshwater habitats higher up the Thames appears to coincide with the equally phenomenal spread of the black-headed gull, also from the estuary to the ponds, lakes and reservoirs of London.

P. jenkinsi seems to have been observed many years earlier than by Jenkins. Jeffreys (1862: 69) states, "I received some years ago from the late Mr. G. B. Sowerby two specimens of *Hydrobia Ferussina*, which he said had been found in Hampshire." Many years later W. H. Dall examined these specimens in the Jeffreys collection, now at Washington, and considered that they agreed in every respect with *P. jenkinsi* sent to him by Kennard and Woodward. Sowerby (1859, pl. 14, fig. 11) also figures a *Rissoa castanea* n. sp. taken by J. Pickering in a ditch about two miles below Gravesend. According to Jeffreys (1862: 68-69) these shells, "which Forbes and Hanley considered (but with some doubt) to be a variety of *H. ventrosa*, bear such a close and suspicious resemblance to a Cape of Good Hope species of *Hydrobia*, that I cannot venture to include it among the British Mollusca . . . Both Mr. Pickering and myself have failed to rediscover this species in the spot where he originally found it, although we have at different times carefully searched for it." The figures suggested *P. jenkinsi* to Kennard (1941), who also regarded the *Rissoa ventrosa* var. figured by Forbes and Hanley (1852, 4, pl. 133, fig. 7) and collected by Pickering at Grays, as synonymous with *P. jenkinsi*. Attempts have been made to identify *P. jenkinsi* with foreign species, such as *P. crystallinus* (Pfeiffer) from the West Indies and *P. badius* (Gould) from New Zealand, but they have been shown to differ anatomically.

Kennard (1923: 249) discarded the current theory of its recent introduction into this country, in view of its alleged occurrence in pre-18th Century deposits. He later re-examined specimens from a Roman deposit at Bath, determined as *Hydrobia ventrosa* by R. Etheridge and R. B. Newton, before *P. jenkinsi* had been described. These he states (1941) "are certainly *jenkinsi*. I can therefore state definitely that the species was living in England in Roman times." The subject was taken up again by the Danish workers, Bondersen and Kaiser (1950). Bondersen examined the British 'sub-fossil' material and agreed with Kennard's determinations, but he considered the specimens too well preserved to be regarded with certainty as 'sub-fossil.' If Bondersen is correct, then Kennard's long life-time's experience of such material had misled him. Bondersen agreed that those from Bath were fossil, but were all *Hydrobia ventrosa*. The writer submitted all the 'sub-fossil' material to the late Hugh Watson, who stated (*in litt.*, 1951) that all the shells named by Kennard seemed to him to be correctly identified and that the shells from the Roman deposit at Bath were, in his opinion, "certainly not *Hydrobia ven-*

trosa." Watson was studying *P. jenkinsi* at that time, but he died without publishing the results of his investigations. In view of his reputation for meticulous work and cautious writing, we must, pending further investigation, leave the last word on this debatable subject with Hugh Watson.

Assiminea grayana Fleming was first discovered by W. E. Leach in 1816 on the banks of the Thames near Greenwich. Jeffreys forty years later found it along the Thames bank for about three miles, from Greenwich to Woolwich, in countless profusion in muddy places, under stones and especially about the roots of water-flag, seldom under water. In 1869 he traced its range to a little below Gravesend. Leslie (1870) pointed out that it was equally abundant on both sides of the Thames wall at Erith, growing to nearly twice the size in the brackish ditch. Kennard found it still abundant at Erith in 1909 (Kennard MS.) and, with Stelfox, in 'millions' at Greenhithe in 1911 (Stelfox MS.). Jenkins and Grocock (1891 : 10) record it as fairly abundant between Purfleet and Tilbury. It was still at Purfleet in 1904 (Kennard collection), but B. B. Woodward (1903 : 90) says 'becoming extinct.' It still survives near Woolwich, as there are specimens in the Plumstead Museum collected by R. G. Rigden in the Royal Arsenal in 1950.

Lymnaea glutinosa (Müller) was recorded for the London Area by Cooper (1836 : 126) "on leaves of *Nymphaea lutea* at Stanmore, Middlesex" by J. Carter and "at Battersea" by T. Bell. The record for Barnes by Loydell and Rowe (1883) was based on a misidentification, admitted by Rowe and pointed out by Cockerell (1886). In spite of this, Woodward (1902B : 72) still gave Barnes as a locality for the species. No one appears to have seen the species again at any of these sites and it must be long extinct in the area.

Aplexa hypnorum (L.) was first recorded as British by Lister (1692), who states that it was found at Mitcham by J. Petiver. The first post-Linnean records appear to be those of D. Cooper (1836 : 126), from Grove Lane, Camberwell, and from Battersea, Mitcham and Shacklewell near Dalston. Specimens from Camberwell, *ex* Pickering collection, are in the Kennard and Woodward collection.

That there is still scope for finding species new to the Home Counties is shown by Kerney and May's (1960) discovery of *Planorbis vorticulus* Troschel in 1959 in a pond near Staines.

Boycott was doubtful of records for southern England of that local species, *Planorbis laevis* Alder. Ashford collected it in a pond at Tottenham in 1885 (Cooper & Loydell, 1909 : 228) and, in the Kennard collection, there are specimens from Highbury collected by 'J.H.P.' There are specimens from Dagenham, Essex, in the British Museum, according to Webb (1897). Woodward (1902A : 82) records the species from St. Margarets, Hertfordshire, but Stratton (1955 : 90) appears to reject this and says "not now living in Herts." Kennard, in his MS notebook for Kent, records three examples from Greenhithe, which are the source of Woodward's 'Thames Marshes' in his Kent List (1908 : 101). T. D. A. Cockerell found two broken specimens in

1884 in "rejectamenta of the Thames" at Kew and his determination was verified by Taylor (Taylor and Roebuck MS.), but Boycott felt unable to accept this as a Surrey record. However, it can now be claimed for certain from Surrey, and from London, since Kerney (1955) found it in 1954 living in the lake at Dulwich Park.

The *Vertigos* seem to be rare or rarely found in the London Area. *Vertigo antivertigo* (Draparnaud) is of particular interest, as it was first found in this country on Wimbledon Common in 1817 by Gray, who presented the specimens to the British Museum (Gray, 1840 : 204). It was, at one time, abundant on Barnes Common, specimens collected by H. Groves in 1875 are in the Kennard collection and it was still abundant in 1882 (Loydell and Rowe, 1883 : 21). It is recorded for a few localities in Kent, Essex and Middlesex, and in Hertfordshire, Oldham (1911 : 159) recorded it from near Watford and Stratton (1948 : 27) from Aldenham.

Vertigo substriata (Jeffreys) is known from a few scattered records for Essex, Surrey (Redhill) and Kent (Westerham), and it was only in 1956 that Dr. Lloyd-Evans (1957) found the first living specimens for Hertfordshire, at Hoddesdon.

Vertigo moulinsiana (Dupuy) was first found in the London Area in 1879 by H. Groves, in company with Jeffreys and Rimmer, in a large marsh by the river Lea near Rye House (Groves, 1880). Some of the specimens collected on this trip are in the Kennard collection. Webb (1897 : 45) states that the Essex Field Club had specimens from Roydon in the Laver collection. This may be the Rye House locality, which adjoins Roydon parish, and Laver was a contemporary of Groves. In Middlesex, Cooper collected it in 1906 in beds of *Glyceria maxima* near Colnbrook (Cooper, 1907) and in 1924 Oldham (1925) found about thirty specimens, all crawling on the foliage of *Glyceria*, and of *Iris pseudacorus*, by the canal at Harefield, where it was still abundant in 1929 (Wilkins, 1930).

Pupilla muscorum (L.) appears to be very scarce, or poorly recorded, in the London Area. Harting (1875 : 30) says it has been found in, or near, London and that it is "partial to old walls and roots and may be looked for with a good chance of success about the artificial rock or grotto work with which many fern-growers are wont to ornament their gardens." Rich had found it not uncommon at Hampton (Harting, 1875 : 88), but Cooper and Loydell (1909) found it, in Middlesex, only in Harefield chalk pit. Specimens collected by Groves at Fulham in 1874 are in the Kennard collection. Stratton (1950 : 122) records collecting it in the water meadows at Aldenham, Hertfordshire, but he has only one other record for the last fifty years in his county list (1955 : 95). There are few published records for south of the Thames, but the species is probably not so rare as lack of records suggests, being locally frequent in suitable areas of dry chalkland; it is certainly so at Coulsdon, Surrey (Jones & Castell, 1961 : 134).

Lauria anglica (Wood) has the distinction of being recorded only once for the London Area, near Denham, Buckinghamshire, by A. J.

Saban, according to Cooper (1925 : 252). Saban was a member of the Conchological Society from 1914 to 1924.

Abida secale (Draparnaud) was recorded by D. Cooper (1836 : 124) as "on the borders of the Thames" and was found by Rich on an old wall at Sudbury near Harrow at least a hundred years ago (Harting, 1875 : 30; Jeffreys, 1862 : 243) and by Bullen in 1911 at St. Albans, Hertfordshire (Oldham, 1913 : 20).

Ceciloides acicula (Müller) appears to be rare or overlooked. Horsley (1909 : 435) suggests looking for it on buried bones and states that dead shells may be found in mole heaps and in river detritus; he gives several localities in north-west Kent. Daniel (1870) says that, at Epsom, he occasionally met with living specimens at the roots of herbaceous paeonies, irises and lilies. In some cases the plants were not quite healthy and he suggests that the molluscs may be seeking parasitic grubs feeding in the roots. He had never found any specimens previously in Surrey. Boycott (1921 : 241) recorded a single dead specimen from flood rubbish from the river Colne at Aldenham, but there are no other records this century from our part of Hertfordshire. It is not recorded by Cooper and Loydell (1909) from Middlesex, but in the Kennard collection there are specimens from Fulham collected by Groves in 1874. In recent years, Dr. Quick has demonstrated to parties how easy it is to find dead shells in the surface layers of ant-hills in the chalk grassland of Box Hill and how, by much perseverance, living specimens may be found at depth in such friable soil.

Clausilia rolfhii Turton was first discovered by a Mr. Rolph in Charlton Wood, Kent, and specimens from Charlton, collected by T. Bell, are in the Kennard collection. Leach (1820 : 119) says "it has since been found there by myself under moss. The wood having been cut down, and the land cultivated, no specimens have been taken for several years."

Laciniaria biplicata was first described and figured as *Turbo biplacatus* by Montagu (1803 : 361, pl. 11, fig. 5). He says "We first discovered this species sparingly at *Easton Grey* in *Wiltshire*; and many years after observed it in the cabinets of Mr. SWAINSON and Mr. SOWERBY, in *London*; by whom we are informed, it was not uncommon in the neighbourhood of the Metropolis, especially in *Hyde Park*." Montagu (1803 : 362, pl. 11, fig. 6) also described and figured *Turbo labiata* Solander, a South European species, and says "That it is found in the neighbourhood of *London* is without doubt, as Mr. SWAINSON informed us it was noticed in *Hyde Park*, about twenty years ago, adhering to the trunks of trees, on the north side of the serpentine river, near its banks. This gentleman further remarked, that he believed it to be scarce, never having found more than three or four, and those in an ozier-ground in *Battersea* fields, near the windmills, as far back as the year 1790." Turton (1831 : 74) states of *Clausilia labiata* "the only one we have ever seen, came from the cabinet of Mr. Sowerby, who expresses a doubt of its ever having been found in England, being a native of Malta." Jeffreys (1830 : 353),

under *C. labiata*, states "I observed a specimen of this shell in the extensive collection of Mr. Lyons of Tenby, who said it came from Hyde Park, near the Serpentine river" and added (1833 : 513), "Mr. Lyons informs me that his specimen was presented to him by Miss Pocock." According to Kennard (1944 : 79), the specimen was not in the Lyons collection at Tenby Museum and probably did not reach the Museum.

Jeffreys (1862 : 286) states that "*C. labiata* was introduced by Da Costa and Montagu into the British fauna on the authority of Mr. Swainson; but both of the localities mentioned by the latter (viz. 'an osier-ground in Battersea fields' and 'Hyde Park near the banks of the Serpentine') are more applicable to *C. biplicata* than to the species in question, which inhabits dry situations." It is interesting to find a note on the subject in a MS catalogue of British Shells of J. T. Swainson (the father of W. Swainson) now in the British Museum (Natural History). It covers a period from about 1780 to 1810, and his entry is under *Turbo labiatus*, for which he gives the synonym "*Stromb. perversus* DaC, p. 107, t. 8, f. 15," which is regarded by Kennard and Woodward (1926 : 270) as *Clausilia bidentata*. He says "Found many years ago by G[eorge] H[umphrey]'s sister on the N. side of the serpentine in Hyde Park and in 1789 I found them with G. H. in an osier-ground near Mills in Battersea fields but r.r. [very rare]." However, there are specimens of *C. biplicata* in the Kennard collection from Hyde Park, *ex* Lemuel Ley coll., and from Battersea, *ex* R. Sheppard coll.

Cooper (1836 : 123) records *C. biplicata* from Hammersmith, but no further details of the London localities are given until Jeffreys (1862 : 283), who says "At the roots and in the bark of old willow trees . . . banks of the Thames near London, where the species is not uncommon." Tate (1866 : 167) states "it may be found in some abundance under the large osiers bordering the banks of the river Thames about Hammersmith." T. D. A. Cockerell (1884) found it to be fairly common on a bank near the Thames at Hammersmith, living at the roots of *Urtica dioica*, *Lamium album* and *Nepeta glechoma*. Young shells were common and he found six or seven full grown living specimens. He later records it on the Surrey side of the river near Hammersmith (1890 : 5). Webb (1895 : 227) remarks that "at various times the writer has collected some hundreds of specimens on the southern banks of the River Thames in a spot [at Putney] once a swamp, now 'improved' by the contents of many dust-heaps, fenced in and made useful, and from first to last he was often deceived by the shrivelled bud-scales of the old osiers, at the bases of whose stems the sought-for molluscs lived." By 1899 he says that Putney could no longer be considered a habitat and that he failed to find the shell at Hammersmith; it was, however, by no means rare at Mortlake (Webb, 1899). Cooper and Loydell (1909 : 226) recorded it for Chiswick close to the Thames and believed that the Hammersmith locality had been destroyed.

Boycott (1929 : 341) was still able to collect the species at Chiswick by Barnes Bridge in 1929. He says that progressive urbanisation of recent years seemed to have led to its disappearance from Putney and Hammersmith, but it could still be taken abundantly in at least two loci three or four miles further upstream, namely Barnes, Chiswick and Mortlake. He gives details of the habitat—a very ordinary hedgebank [Kew Meadows Path] 120 yards from the river between Mortlake and Kew. The other locus was an artificial bank in market gardens and a neighbouring railway embankment on the north side of the river, close to Barnes Bridge. In 1951 there was still a thriving colony near the tow-path from Barnes Bridge to Mortlake, but recent hedge trimming and burning resulted in many dead shells. There were other small colonies on the Chiswick side of the Thames near Barnes Bridge (Davis, 1952).

It must be rare, indeed, for a snail to provide a vital clue in a detective story, but Dr. R. Austin Freeman (1922) made use of the restricted distribution of *Clausilia biplicata* to enable his Dr. Thorn-dyke to locate the hiding place of stolen jewels along the Thames towing path. Dorothy Sayers remarked that “the average reader knows that when Austin Freeman drowns somebody in a pond full of water-snails, there will be something odd and localised about these snails.” He was a physician and surgeon at Middlesex Hospital and later at Holloway Prison; although never a member, he contributed records of Mollusca to the Conchological Society.

The snail has been recorded for a few other London localities. Leslie (1874 : 35) reported finding “two shells amongst the tidal refuse on the [Thames] shore at Dartford Creek”; they were probably washed down from higher up the river. An interesting site is Purfleet, where W. Whitaker collected specimens in 1870. Whitaker's site may well be that of Jennings (1921), who discovered the shell on the up platform of the railway station and on the chalky banks close by in 1919. In 1929 it also occurred in the entrance to an old chalk pit near the station (Boycott, 1929 : 342). The only other localities in this country where the species is still known to occur are Coe Fen, Cambridge and Bickenhall, Somerset (*J. Conch.* **23**: 116).

The Kennard collection, in the British Museum (Natural History), is rich in material of this species. There are specimens from Kensington, Plaistow Marshes and Deptford Creek, all *ex* J. Pickering collection; Battersea, R. Sheppard, and from Hyde Park *ex* Lemuel Ley collection; Whitaker's 1870 Purfleet specimens; H. Groves' collecting is represented by Chelsea Town Meadows and Fulham Meadows, both 1874, and Putney, 1878. Specimens from Kew are dated 1860, collected by ‘W.B.’, and from near Richmond, 1872. Other more usual localities are Castlenau (? = Barnes Bridge), Hammersmith, Chiswick and Mortlake. It would seem that Gray's remark (1840 : 37) “it is very common in several places near London” is supported by the material in the Kennard collection. The identification of this species by Kennard from a Bronze Age deposit at Walton Heath, at a depth

of $2\frac{1}{2}$ feet at Reigate, and in an alluvial deposit at Fulham, suggests that it is a native species.

Testacella maugei Férussac is known from London from two records and London represents the eastern limit of this south-western species. Cooper and Loydell (1909 : 219) state that there is a single specimen in the British Museum from a garden at Kensington, bequeathed by a Mrs. Robinson in 1848, and Pannell (1902 : 170) records it from Leatherhead, collected by E. Step.

Testacella scutulum is essentially a London slug. It was first described and figured by G. B. Sowerby (1821) from his garden in Kennington Road, Lambeth, and Cooper (1836 : 121) adds "kitchen and forcing gardens attached to the Royal Palace at Kensington." Numerous records exist for the London Area, especially for Middlesex. From about 1846 Tapping had noted the slug in one spot in the Middle Temple Gardens, in the shelter of a wall, and he described it (1856 : 5105) as a new species, *Testacella medii-templi*, a name which had a very short life, for it was soon sunk by Jeffreys (1862 : 146) in the synonymy of *T. scutulum*.

In spite of the searchings of conchologists over many years, no one has yet found a living specimen of *Helicodonta obvoluta* (Müller) in the Home Counties. S. J. Da Costa stated (1886) that "During the past two years and again in May last, I have found some half-a-dozen of the shells in the woods of Norbury Park, Surrey. It is true that all of them were dead specimens lying on the surface of the leaves from beech trees which had fallen in the previous autumn, and although I searched diligently for living representatives I have hitherto failed in finding any, still as those discovered were in different parts of the wood, I feel convinced the animal must have established itself in the neighbourhood." Two dead shells were found during a visit by members led by Mr. A. E. Ellis in 1950. A. G. Davis led another visit in 1951, with the object of searching for the species. Seventeen dead and bleached shells were found, mostly by searching chalky rubble disturbed by the burrowing of rabbits; others were found in rubble exposed by uprooted trees. The rabbits had also thrown out a Neolithic flint flake and a mineralised *Helix pomatia*. Davis (1952) concluded that the specimens had come from a Holocene deposit. *H. obvoluta* has been found in Holocene deposits at Betchworth and Epsom (*J. Conch.* **22** : 99) and is evidently a waning species that has become extinct in this part of the country.

The North Downs in Surrey might be claimed as the headquarters of *Helix pomatia* Linné in this country; it becomes less abundant in West Kent. The species occurs as near as $11\frac{1}{2}$ miles from St. Paul's, 34 being seen on one day, in June 1952, on rough chalky ground half a mile south of Carshalton Beeches station, by Crawford (1953). It is no longer considered to have been introduced by the Romans, in view of its occurrence in pre-Roman deposits. However, Da Costa (1778 : 70) was quite certain of its more recent introduction. He states categorically, "This *snail* is not *indigenous*, or originally a *native* of these

kingdoms, but a *naturalised species*, that has throve so well as now to be found in very great quantities. It was first imported to us from Italy about the middle of last century, by a *scavoir vivre*, or *Epicure*, as an article of food. Mr. Aubrey informs us, it was a *Charles Howard, Esq.*; of the *Arundel family*, who, on that account, scattered and dispersed those snails all over the downs, and in the woods, etc. at *Albury*, an *antient seat* of that *noble family*, near *Ashted*, *Boxhill*, *Darking*, and *Ebbisham* or *Epsom*, in *Surrey*, where they have thriven so much that all that part of the *county*, even to the confines of *Sussex*, abound with them; insomuch that they are a nuisance and far surpass in number the *common*, or any *other species* of *English snails*." He is not so credulous in other matters, for he considers that "*Varro* is scarcely to be credited, when he says some would grow so *large* that their *shells held ten quarts*."

There is an extraordinary statement in Reeve (1863 : 61), "To its efficacy in cases of consumption I am able to testify on personal knowledge. Mr. Barlow, of the firm of John Dickinson & Co., paper-makers, informs me that he has a brother who was in the last stage of consumption, when their father resolved to try the experiment of a diet of Apple Snails. Specimens had been transported from Italy some thirty years before by an English nobleman, for the same purpose, to the range of hills in the neighbourhood of Reigate and Box Hill, in Surrey; and as they had bred abundantly, Mr. Barlow was induced to take a house in that locality. The expressed mucilaginous juice of the snail was administered to the patient, without his knowledge, in every conceivable form. It was taken in jellies and preserves, in gravies and with *entremets* of meats. In the course of a twelve-month, the invalid was entirely cured, and he went to the Crimea, and is living at this moment a strong hearty man."

Hygromia limbata (Draparnaud) has always been associated with South Devon, since Kennard discovered it there in 1917. J. Alder (1837 : 106) records it on the authority of G. B. Sowerby from near London. Sowerby found it living on brambles in hedges near Hampstead on the "New North Road to Barnett" (Gray, 1840 : 143) and Reeve figured it in 1853 in his *Conchologia Iconica* as a British species; the specimens are in the British Museum (Natural History). It was not found again and Sowerby believed it to have been accidentally introduced with foreign plants. He did not figure it in 1859 in his *Illustrated Index of British Shells*.

Hygromia subrufescens (Miller) was recorded under *Helix fusca* for "Morden College fields" by Cooper (1836 : 122). Ellis (1926 : 216) gives 'Surrey (formerly at Blackheath).' Morden College is at Blackheath, Kent, and the census records for Surrey, both in 1921 and 1951, perpetuate an error. There appear to be no reliable records for the Home Counties for this species or for *Hygromia liberta* (Westerlund). *Monacha cartusiana* (Müller), a coastal species, seems unlikely to occur in our area, in spite of Cooper's (1836 : 122) records for Hampstead, Banstead Downs and the chalk pits at Lewisham and Charlton.

White Hill, Chaldon, Surrey, is now the only British locality for *Helicella elegans* (Gmelin), where it was first discovered by G. L. Wilkins and seen by a party of members of the Conchological Society in 1931 on a grassy chalk hillside (Wilkins, 1931). The Society visited the area again in 1950 and found the colony still flourishing (Davis, 1951). The area forms part of a Site of Special Scientific Interest, scheduled by the Nature Conservancy on the recommendation of the London Natural History Society.

Gray (1840: 107) tells us that our common slug *Arion hortensis* Férussac "was first noticed as English by Dr. Leach, who determined the species, and placed several named specimens, from Cobham and other parts near London, in the British Museum collection in 1817"; he adds that "it is equally common in my garden at Blackheath."

In Taylor's *Monograph* (1904: 144-147), there are numerous records of *Milax gagates* Draparnaud and its varieties from London's suburbs in Middlesex, and yet Cooper and Loydell, in their Middlesex list (1909: 221), say "we have failed to find this slug, although it is said to be fairly common."

Milax sowerbyi (Férussac), according to Taylor (1904: 151), was first described by Férussac in 1823 from specimens sent to him from the neighbourhood of London by G. B. Sowerby. It was, however, first noticed by Leach, who received it from Chelsea, gave it the name of *carinatus* and put it in the British Museum collection in 1817 (Gray, 1840: 116). The specimen figured in Reeve (1863: 17) was collected by his artist, O. Jewitt, at Hampstead. In 1951 it was found by Bensley (1952: 83) under a brick in the ruins of Girdler's Hall in the City of London.

The recognition in 1930 of *Milax budapestensis* (Hazay) as a British species renders many of the older records of *M. gagates* and *M. sowerbyi* doubtful. *Milax* cf. *insularis* was recorded by Quick (1960: 156) from Bexhill in Sussex; as this can be separated from *M. gagates* only by anatomical characters, we are left with only one certain record of *M. gagates* s.s. in the London Area, that from Epsom (Quick, 1960: 155).

Limax tenellus Müller is a very local species, occurring in old woods on chalk in Hertfordshire at Watford and St. Albans and in Epping Forest, where, according to Taylor (1906: 270) it was widely distributed and common, feeding on fungi.

Sphaerium rivicola (Lamarck), according to Reeve (1863: 237), was "more abundant in our metropolitan rivers, the Thames, the Lea and the New River, than in any other part of the kingdom." It was abundant in the Brent and the Lea in the 1880's and widespread in canals and rivers, including the Thames, in Middlesex, according to Cooper and Loydell (1909: 231). Yet it seems to be absent from the southern part of Hertfordshire (Stratton, 1955: 112), although Woodward (1902A: 82) records it from Rickmansworth. Mr. T. E. Crowley informs me that it still occurs in the Grand Union Canal at Uxbridge, Middlesex.

Sphaerium transversum (Say) is a species which was first discovered in this country in London, although it is now extinct in the area. Gray (1856) says "These shells were first brought to me at the British Museum by an intelligent collector, Mr. John Rowse of Brownlow Street, Endell Street. He discovered them on the 17th day of May, in the Grand Junction Canal near Kensall Green, and the following day most kindly furnished me with several living specimens for examination. They are not abundant in the locality named." Gray considered it a new species and gave it the name *pallidum*. It is interesting to note the speed with which Gray worked and the material was printed; a letter dated 20 May, with description and figure, appears in the issue for June of the *Annals and Magazine of Natural History*. Jeffreys collected it from the same locality and Daniel had already found the species in the Grand Surrey Canal, probably near Camberwell, but thought it was a variety of *S. rivicola*. There are two doubtful records for Essex: a shaded pond amongst water crowfoot, Woodford, 1888, H. A. Sauzé, confirmed by W. Crouch (Sauzé, 1889) and quoted by Webb (1897: 79), and Stratford Pond (Loydell and Rowe, 1883: 19).

Three species of *Pisidium* were first described and figured by Jenyns (1832) from London specimens. *P. nitidum* Jenyns was "from ditches in Battersea Fields and in other parts of Surrey." The largest of his *Pisidium pulchellum* were also from the neighbourhood of Battersea Fields, and his *pulchellum* var. δ (now *P. milium* Held) was from Bookham Common, Surrey.

The story of the discovery of *Dreissena polymorpha* (Pallas) in this country is an interesting one. J. de C. Sowerby was shown specimens in 1824 by a relative, James Bryant, who had found it attached in abundance to shells and timber in the Surrey Commercial Docks at Rotherhithe and had been using the animal as bait for perch (Sowerby, 1825). Gray (1840: 303) observed that "it has since been widely extending itself, and is now to be found in most of the docks communicating with the Thames" and he considered "it most likely has been introduced with timber from the Volga." Jeffreys (1862: 48) states "That in one respect this species may be said to be truly metropolitan; for it has been found in the most frequented streets of London, after they have been flushed with water from the New River, where it abounds. Mr. Norman informs me that he saw immense numbers of the *Dreissena* in a living state, lining some of the iron water-pipes which had been taken up in Oxford Street." Kerney (1957) recorded its occurrence in 18th or early 19th Century alluvium forming the bed of a disused part of the New River, in which the species must have been an early colonizer. It was still causing trouble in water pipes as late as 1912, when many tons were removed from a 36-inch unfiltered-water main at Hampton-on-Thames, the diameter being reduced to 9 inches (Kirkpatrick, 1924). It had spread up the Thames, at least as far as Walton, by the 1870's. There are specimens from Barnes reservoir collected in 1921 in the Kennard collection. In

Middlesex, Cooper and Loydell (1909 : 230) reported it from the "Grand Junction Canal, Alperton (mostly dead shells)." Oldham (1917 : 124) records it higher up the canal at Berkhamstead, Hertfordshire, outside our area, but Stratton gives no later records for the county. There appear to be no records for Surrey, outside the Thames and its vicinity, and none outside the Lea Valley for Essex. A. G. Davis (1957) exhibited living specimens from Loxwood reservoir, Walthamstow. It is a noteworthy absentee from Kent.

Probably the greatest contrast, from the mollusc's point of view, between north and south London, lies in the relative nearness and greater expanse of the chalk south of the Thames; it even reaches the river from Dartford to Gravesend. A small area of chalk occurs along the west boundary of Middlesex and extends up into Hertfordshire, where much of it is, however, covered by deposits of gravel and sand. There is a small patch of chalk in south-west Essex, from Purfleet to Grays Thurrock. *Pomatias elegans* is abundant in Kent and Surrey on the chalk and it occurs, or occurred, in Middlesex only in the old chalk-pit at Harefield (Cooper & Loydell, 1909 : 230). It is abundant locally near Aldenham, Herts, where Boycott (1921) found 400 specimens, after rain, in 100 yards of chalky hedgebank. In Essex, however, Crouch 1891B : 206) searched for it at Grays Thurrock and at Purfleet and could not find even a dead shell; yet it is abundant just across the Thames in Kent.

On the other hand, the Lea and Colne and the associated canals are rich in aquatic molluscs and have no real counterpart south of the Thames.

Most snails in our area have suffered severely, not only from bricks and mortar, but from the great increase in intensive cultivation (especially in gardens), pollution from factories and sewage, particularly in the Thames estuary, and from atmospheric pollution. The latter inhibits the growth of mosses and lichens and makes an acid soil even more acid, so rendering habitats uncongenial for snails. Essex suffers badly from this type of pollution. French (1899) was already commenting on the deterioration in the county molluscan fauna. The almost complete absence of *Pomatias elegans* was in striking contrast with its great abundance in Essex in Roman and in comparatively recent times. It was thought to be quite extinct in Essex, but in 1890 a small colony was discovered living at Felsted, outside our area. In Essex the surface soil, according to French, had been deprived of its calcareous ingredients by tillage and, with drainage, there had been a considerable reduction in humidity. *Retinella pura*, formerly very abundant in Essex, was now hastening to local extinction and was found only as single specimens, few and far between. Kennard and Woodward (1926A : 74) comment on the Essex molluscan fauna, which they say, "has more affinity with that of Suffolk than with the Kentish, possibly from the Thames being an effectual barrier. This is well shown on comparing the districts of Grays and Northfleet where the geological conditions are the same, *Pomatias elegans* (Müll.) and

Clausilia rolpheii Leach being common in the Kentish district and absent from the Essex. As is to be expected, the Essex freshwater mollusca are practically identical with the Kentish. That the molluscan fauna of Essex is waning is clear from historical evidence. The Lea Valley was at one time particularly rich in land mollusca, and was a happy hunting ground of the early malacologists, but at the present time they are rare and this in districts where the influence of man has been practically nil. *Helix nemoralis* Linn. has almost disappeared, although it was abundant fifty years ago. *Paludetrina ventrosa* (Mont.) is no longer to be found in many of the Thames habitats where it was formerly abundant, and *Pseudamnicola confusa* (Frau.) has apparently disappeared entirely from the Thames estuary. The causes of this diminution have yet to be discovered, but it is clear that human activity is not the only factor. On the other hand, owing to the growth of human population, certain species which benefit by the growth of gardens are extending their range." *Testacella haliotidea*, *T. scutulum*, *Agriolimax reticulatus*, *Milax gagates*, *M. sowerbyi*, *Arion hortensis* and *Helix aspersa* are listed as some of the species that were increasing, to which might be added *Oxychilus draparnaldi* and *Milax budapestensis*.

Possibly the greatest sufferers are the Mollusca of ponds, for within recent years ponds have been disappearing at an ever increasing rate. There were 108 ponds in the parish of Aldenham in 1916, of which Boycott (1930 : 5) found 14 filled in during the next ten years; there are probably only a few left now. Conchologists do not appear to have shown much interest in the preservation of these and other disappearing molluscan habitats. There has been a striking increase in the size and numbers of Metropolitan Water Board reservoirs in our area in the last fifty or sixty years, but no account of the Mollusca of any of them appears to have been published. The co-operation of the innumerable ornithologists who frequent them might be sought in order to establish whether birds feed on the molluscs and if so, on what species and where.

When going through county or other molluscan lists, one is struck by the lack of habitat and status details, so important if one is interested in the changes we have been considering. Even Stratton's otherwise excellent list of the Mollusca of Hertfordshire (Stratton, 1955) is little more than a list of localities; a local or rare species may well arouse more interest among collecting conchologists and result in more locality records than others frequently met with. The status of species varies over the years, as we have seen, and opportunities for comparison are lost if observations, or even subjective impressions, are not recorded.

Such details have always been omitted from our own published Recorder's Report and sometimes even the locality is omitted. A fuller report, with field details (where supplied) would surely be of much greater interest and value, even if more costly to print. We

might, with profit, follow the examples of the recording in the journals of the Botanical and the Bryological Societies.

A reference to our Census, in connection with London Mollusca, suggests that records tend to get fossilized. *Hygromia subrufescens* and *Sphaerium transversum*, for example, do not appear to have been seen for at least a century in our area and yet they are listed and mapped for West Kent and Middlesex respectively. As our Recorder states in the introduction, our last Census has largely achieved its object—a representation of the range of the species. But it is a cumulative picture, covering the last 86 years and not a true picture of the known distribution in 1951 or even for the period 1900-1950. It looks as though now is the time to start building up a fresh picture, based on distribution in the 10 kilometre grid squares, as the botanists are doing, rather than on the century-old vice-county system. Perhaps a start might be made on the London Area, where little work seems to have been done, or at any rate published, during the last fifty years. The Society is now centred on London and it should be possible by the co-operation of London members eventually to produce a much more adequate account of the existing molluscan fauna of the London area than is possible at the moment.

One of the most intensive pieces of work on local Mollusca was that undertaken in the London Area by Boycott in his parish of Aldenham, Hertfordshire, from 1915 until his death in 1938. It was a parish of 600 acres and, although Boycott says it was not a very good place for snails and slugs, with only 49 species, many not at all common and with no interesting rare species, he was able to produce several classic papers on the molluscan ecology of his district. "The freshwater Mollusca of the parish of Aldenham" appeared in 1919 and "The land Mollusca" in 1921; both were presidential addresses to the Hertfordshire Natural History Society. "A re-survey of the freshwater Mollusca" followed in 1930. The results of a life-time's work appeared in "The habitats of land Mollusca in Britain" (1934) and "The habitats of fresh-water Mollusca in Britain" (1936). When Mr. L. W. Stratton came to live in the same parish, he was inspired by Boycott's work to take up an ecological study of the local Mollusca and he produced "The land Mollusca of the parish of Aldenham: a re-survey" (1950). I doubt if the molluscs of any part of the country have been studied more closely than those of Aldenham, and the papers, although published by a local society, are of national importance.

I conclude with Boycott's words, which may inspire some of our members to follow his example, if only in a small way. "The study of the common snails which live here is of some interest, and raises a good many curious problems, of how and why snails live where they do, and why this is a 'good' and that a 'bad' place for them. Working ground which lies at one's back door has obvious advantages, especially when it is an unproductive as this area; the gradual revelation of fresh sorts as one goes over the same places again and again

is in itself instructive and it is difficult to exaggerate the importance of examining the habits and customs of the various species at different times of year . . . Even with repeated search, one has no doubt to be a little cautious, though I repudiate unhesitatingly the suggestion that it is impossible to form any just appreciation of the abundance of snails, because they are on the whole difficult to find and are particular about the circumstances under which they are prepared to go openly in the world." (Boycott, 1921 : 221).

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VIVIPARUS VIVIPARUS (L.) IN IRELAND

By N. F. McMILLAN and A. W. STELFOX

(Read before the Society, 21 January, 1961)

It has been generally accepted that no species of *Viviparus* is native in Ireland, in spite of Brown's (1818) definite record of *Viviparus viviparus* (L.) from Newtownards, Co. Down, and the finding by Fogerty (1909) of a dead shell of the same species at Limerick. In this connection, see Stelfox (1911, 130). The late R. A. Phillips, however, found at least a score of shells of *V. viviparus* in material dredged from the rivers Suir and Barrow in southern Ireland at different times from 1911 to 1922, and the purpose of this note is to draw attention to the existence of these important specimens and to give all the available information concerning them.

Most fortunately the letters of Phillips to A.W.S. have been preserved, with the exception of the first five, of which only summaries were kept. His remarks on other Mollusca associated with *V. viviparus* are quoted where they throw light on the possible origin or age of the *Viviparus* shells. The dates cited below are those of these letters.

1 March, 1912. Records a young *Paludina vivipara* from estuarine clay at Waterford, dredged from the river Suir for the foundations of a new bridge.

6 March, 1912. Lists the following species, also from the estuarine clay at Waterford: *Valvata piscinalis*, *V. cristata*, *Limnaea peregra*, *L. palustris*, *L. truncatula*, *Pisidium amnicum* (Grays form, i.e. triangular, see B.B.W.), *Sphaerium corneum*, *Vitrea crystallina*, *Hygromia hispida*, *Helix nemoralis*, *Succinea pfeifferi* and *Carychium*. Marine species, named by R. Standen: *Cardium edule*, *Mytilus edulis*, *Mya arenaria*, *Tellina balthica*, *Buccinum undatum*, *Littorina littorea*, *Nassa reticulata*, *Scrobicularia piperata*, *Aporrhais pes-pelecani*. [The reference to B.B.W. is to Woodward, 1913, plate 9, fig. 9.]

25 March, 1912. Reports eight more shells of *Viviparus* from the Waterford beds, with *Succinea oblonga* and one young *Limnaea auricularia* (?).

31 March, 1912. Reports finding *Melania inquinata* [= *Brotia melanioides* (J. Sowerby)] in Waterford estuarine clays. This is common as an Eocene fossil in the Thames valley (*fide* A. S. Kennard).

25 December, 1912. Reports finding "about a fortnight ago" a single halfgrown apparently fossil specimen of *Viviparus viviparus* at New Ross in sand dredged from the river Barrow, about 15 miles from the bridge at Waterford.

9 June, 1913. "I was there [Waterford] last Sunday week and took some material from heaps of sand dredged in the Suir about 10 miles above Waterford, all the *Pisidium amnicum* in it are the same as the one Kennard said was Grays *Pisidium* and agree exactly with the illustrations in Woodward's Catalogue Plate ix fig. 9a-f. They are very different to the form I have taken in other rivers and certainly were not imported in ballast."

1 July, 1913. "Just a line to say that B.B.W. has seen the triangular *P. amnicum* from Waterford and says that it agrees with the Grays fossil form. It certainly did live in the Suir as some of my specimens are quite fresh looking. The material contains curious forms of several other species but I have not yet had time to examine it properly."

8 September, 1915. "As soon as possible I shall do the Waterford deposit . . ."

27 October, 1915. "I had a letter lately from Kennard, he now says that the Waterford Viviparas are not *V. vivipara* but *V. diluviana* (Kunth), a Pleistocene English fossil from Swanscombe and Clacton, and that *V. vivipara* ought not to occur in Ireland. So the mystery of these Suir shells seems to deepen. I am sending him, by request, a good specimen for comparison."

12 December, 1915. "I have since heard from Kennard re the Waterford Viviparas of which I sent him good specimens and he now says they are *V. vivipara*, the West England and Pleistocene form of that species, thus fully confirming your conclusions. I enclose his letter for your perusal. About three years ago, when in the [National] Museum, [Dublin], Dr. Scharff showed me specimens of *V. clactonensis* (*diluviana*) and I was then much struck by their resemblance to the Waterford shells. The engineer in charge of the work at Waterford Bridge told me that the material was dredged at depths varying from three to nine feet. You may remember that I took a single specimen at New Ross in sand dredged from the Barrow, so it looks as if the animal really did live in those rivers."

13 January, 1916. "I find these deposits [of the rivers Suir and Barrow] very interesting but unfortunately have not time yet to write them up . . . I now send you . . . a few *Bithynias* from the Suir sand deposit near Waterford which in their obesity are the exact opposite of *matritensis* and unlike anything I have seen elsewhere."

24 January, 1916. "I may mention that I sent Kennard samples of the sands some months ago and he has promised to report to me on them. They are all dredged stuff and the deposits must be in the bed or side of the rivers, each lot is taken from one spot and the shells, recent and ancient, mixed as you see them."

14 February, 1916. "I had a note from A.S.K. He is at present working at the Suir and Barrow sands I sent him last year. I am glad you found *Bithynia matritensis* in the Suir stuff, I found a few very old specimens of the same in it too."

2 March, 1916. "He [B. B. Woodward] is quite wrong about these sand deposits which have no connection with the stuff in which the *Melania inquinata* and flints occurred. They are taken from the river 14 or 15 miles above Waterford and may have drifted downstream for many miles before being dredged, so they could not possibly contain ballast. If A.S.K. embodies B.B.W.'s views of these deposits in his Irish paper he does so with his eyes open as he has full information as to the conditions under which they occur."

3 March, 1916. "A.S.K. must have been recently influenced by B.B.W. in his views on the sand deposits as in one of his letters to me he explained and seemed quite to understand how these deposits were formed and that they are quite natural. Anyhow I *know* the stuff is not ballast and it has been dredged as one of the boatmen told me 'every day for hundreds of years.' Hardly any ballast is now brought to Waterford and none further up the river at any time."

28 June, 1916. "Many thanks for your letter and the lists which are very interesting and will be useful when I start to write up the sands."

9 October, 1916. "As for his [B.B. Woodward] remarks on the standing of [*Pisidium*] *supinum* he does not or will not understand the difference between the Fiddown and Waterford Bridge deposits . . .

And even if sand ballast *was* thrown into the river at or above Fiddown in past centuries it would not still continue to accumulate there in spite of daily dredgings year after year."

19 January, 1922. "While waiting for a train at Limerick last Sunday I spent a couple of hours collecting drift on the Clare side of the Shannon, there was nothing unusual among the smaller shells, but I found one fully-grown old shell of *Vivipara*, it was lying on the strand with other species."

It is clear that Phillips hoped for the promised report by Kennard on the Mollusca of these Waterford deposits and, failing that, intended to write such a report himself. Neither report, however, materialized. Kennard was probably influenced by Woodward's unshakeable conviction that the shells were only Thames fossils derived from ballast, and he would not go against Woodward's opinion, no matter what his own views were. There is no mention of the Suir and Barrow deposits in Kennard and Woodward's paper on the Irish Post-Pliocene Mollusca (1917).

At the period Phillips was writing about, quite an extensive local trade in sand for building purposes was carried on at Waterford and New Ross. This sand was dredged by local boatmen from the Suir and Barrow respectively in all cases so far as we are aware *well above* the towns mentioned. That landed and dumped on the quays at Waterford came mainly from Fiddown some 20 miles up-river from the city, and likewise that in the quays at New Ross came from up-river often almost as far as St. Mullins, 7 miles up-river, as stated by Phillips.

The so-called "Estuarine Clay" from which the Waterford *Viviparus* came was excavated during the laying of the foundations of the new town bridge at Waterford and must have been very different material from the sands from farther up the river. Whether this was really estuarine clay depends on the relative levels of land and sea at the period of deposition, concerning which we have no exact information at the moment, beyond the fact that Phillips gives a list of marine as well as land and freshwater shells taken at the same time. Phillips, however, never saw the section from which the clays came and the marine and freshwater beds may not have been contemporaneous, but mixed up during the excavation. Phillips was in no sense a geologist and would appear to have been content to pick out all the shells from the dumped material on the quay and assume they were of the same age. This, however, was very certainly not true. The shells of these deposits can easily be separated into two groups, one quite recent looking and the other much older. The shells in the latter category are worn and either blue-stained (in the case of the examples of *Viviparus*), or of a peculiar brownish purple colour. The brownish purple *Pisidium* valves are very like those from Thames Pleistocene deposits.

On the present evidence it is not possible to state whether the shells of *V. viviparus* are of Pleistocene, Post-Glacial or Recent age, but in the case of the specimens from Waterford their claim to be included in the Irish fauna seems to be established. Those from the Shannon (Fogerty, 1909, and Phillips, 1922) are more doubtful and judgment should be reserved.

IRISH SPECIMENS OF *VIVIPARUS VIVIPARUS* (L.)

IN THE NATIONAL MUSEUM, DUBLIN.

3 specimens "dredged in the river Suir at Waterford. Given by R. A. Phillips, 1913."

14 specimens labelled "Near Waterford, 1'/12" [January, 1912]. Phillips collection.

7 specimens labelled "Dredged in the river Suir at the Bridge, Waterford, 1911. R.A.P." Phillips collection.

1 specimen labelled "Sand from St. Mullins, Co. Carlow, New Ross, 12/12" [December, 1912]. Phillips collection.

These shells are all old looking and patinated blue and cream.

IN THE BRITISH MUSEUM (NATURAL HISTORY).

2 specimens dredged from the river Suir, Co. Waterford. Kennard collection.

IN THE POSSESSION OF A. W. STELFOX.

2 similar specimens from the river Suir deposit at Waterford.

Specimens of *V. viviparus* resembling the Waterford shells in their small size (maximum height 27mm.) were taken living in the tidal part of the river Arun near Amberley, West Sussex, 1911 (A.W.S.). The adult shells were much eroded.

For help in the preparation of the above account we are grateful to Mr. C. P. Castell, Department of Palaeontology, British Museum (Natural History), and Dr. J. S. Jackson and Miss G. Roche of the National Museum, Dublin.

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NOTE: It will be noticed that the nomenclature is not uniform throughout. This is because the names used by Phillips have been left unaltered.

CYPRAEA MICRODON GRAY: A RARE EAST AFRICAN COWRY

By M. J. H. LIVERSIDGE.

(Read before the Society, 21 October 1961)

Cypraea microdon Gray is divided by Schilder & Schilder (1938, 163) into three 'races' (subspecies):

A. *microdon* Gray, 1828. South Malaysia to Andaman Islands and Phillipines; Pulo Condor?

B. *granum* nov. Fiji to Tonga, Samoa, New Britain and Torres Straits.

C. *chrysalis* Kiener, 1843. Mauritius to Mombasa (fossil) and Aden.

The fossil record is that of Cox (1930, 141, pl. 13, fig. 13), from a raised reef on the south-east side of Mombasa Island, a quarter of a mile north of Ras Serani. This subspecies has been found living on the Island of Zanzibar by Mrs. C. D. Knight, and the specimen is in the Coryndon Museum, Nairobi.

Two living *C. microdon chrysalis* were found by my father while he and I were collecting on the reef at Diani Beach, some twenty miles south of Mombasa, in January 1961. They were just inside the outer reef, on a coral outcrop which is only uncovered at very low spring tides, both under the same piece of living coral, which was prised up with some difficulty. The underside of this coral was covered with red, blue and green algal slimes, and the coral itself was red in some places and greyish white in others. Two tiny bright red animals were seen in minute niches in the base of the rock and were secured with dental picks. My identification of these cowries was confirmed by Dr. B. Verdcourt, who informed me that they were the first *Cypraea microdon* to be obtained on the mainland of East Africa.

The shell of *C. microdon* is ovoid, usually 8 to 11 mm. in length. The dorsum is of a pale buff colour, freckled with numerous darker brown spots. The base is white; the apertural teeth are exceptionally fine and just visible to the naked eye. The extremities are blotched with conspicuous brownish purple spots. The body is bright red and when withdrawn the red mantle shows through the shell. The colour may be due to the type of coral on which these cowries live. The two specimens found are 9 and 10 mm. in length. The larger one would seem to be the younger, as the dorsum is not evenly coloured and the pattern not fully developed.

The apparent rarity of *C. microdon* in East Africa may be due to the very small shells having been overlooked.

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THE DISTRIBUTION OF *ABIDA SECALE* (DRAPARNAUD) IN BRITAIN

By M. P. KERNEY

(Read before the Society, 17 March 1962)

The map accompanying this note has been prepared to illustrate the new system adopted by the Conchological Society for the geographical recording of non-marine Mollusca, based on the 10 kilometre square units of the National Grid. The small land pulmonate *Abida secale* was selected because the total number of records was not large, and because this species, although fairly widespread in Britain, is very local, and therefore provides a good example of a distribution which is misleading when plotted on the vice-county system (Ellis, 1951, map p. 239). The punching of the record cards and the printing of the distribution map from them was kindly done by Dr. F. H. Perring, director of the Botanical Society map scheme.

The writer used all accessible records considered reliable. A few were omitted deliberately; that for West Cornwall may well be authentic, but was not traced. The largest single source of information was J. W. Taylor's MS. notebook for this species in the Department of Zoology, British Museum (Natural History); published literature was also searched and several friends provided records from their personal collecting. A fact which quickly emerged was that records tend to be repetitive: thus there are many, by different authors, for Ingleton (Yorkshire) and for the Undercliff (Isle of Wight). In the case of the Isle of Wight, the species is much more local than might at first be suspected; in fact *Abida secale* seems to occur in only three out of the ten 10 kilometre squares which cover the island, and is common in only two of them. Furthermore, several vice-county records are based on unique occurrences: that for Shropshire may be traced to specimens in the Shrewsbury Museum collected at Eyton about 1860, that for Nottinghamshire to a colony discovered on Nottingham Castle Rock about 1890, while that for North Lincolnshire resolves itself into a single juvenile shell found near Raventhorpe in 1911. For Kent, it was not listed in the Census until 1921, from Molash, 8 miles W.S.W. of Canterbury; apart from this I could trace only one other record, about 40 years old, from the 'Downs between Folkestone and Dover.'

The new map is a provisional one and will doubtless be amplified. But, in spite of deficiencies, it probably does give a fairly accurate picture of the British distribution of *Abida secale*. The species appears to be virtually restricted to four areas: (a) a narrow strip along the south coast from Devon to the Isle of Wight, and then inland along the open escarpment face of the South Downs, again reaching the sea at Beachy Head; (b) an area centred around the Bristol Channel, the Mendip Hills and the escarpment of the Cotswolds; (c) a smaller area on the Chilterns; and (d) part of the Carboniferous limestone

region of Westmorland and N.W. Yorkshire.

The most important factor controlling this distribution is clearly a geological one, the presence of limestone or, occasionally, calcareous sandstone. In addition, *Abida secale* requires an open environment and flourishes in rather bleak, dry, windswept places with little vegetation and often with a good deal of bare rock. In calcareous areas affording few situations of this kind, the species is absent, for example in the chalky boulder-clay lowlands of Eastern England. Abroad, *Abida secale* has a similar ecology. For France, Germain (1930 : 400) says : "Espèce xérothermique fréquentant les stations chaudes et sèches où elle vit sous les pierres, sur les rochers, parmi les éboulis"; and in the Geneva area Favre (1927 : 231) states : "C'est une espèce calcicole-rupicole, qui ne trouve pas dans nos basses régions aux terrains glaciaires un milieu qui lui convienne."

There are however certain anomalies. Why is *Abida secale* common on the South Downs yet virtually missing from the North Downs ? Why is it very rare over the whole of eastern England, including the Jurassic limestone country and the Chalk Wolds of Lincolnshire and Yorkshire, which offer many apparently suitable situations ? Low winter temperatures might be considered to be the restricting factor, were it not known that *Abida secale* will survive prolonged winter frosts. In the Juras, according to Favre (1927 : 340), its vertical limit, which exceeds 1700 metres, is surpassed by no other species, while Germain (1930 : 400) states that in the Alps it reaches at least 2700 metres, a height which is not very far below the permanent snow-line. It would be helpful to know something about the life-history of *Abida secale*. Unlike most small land snails, which are annuals, it has been known to live to an age of 3 years in captivity (Comfort, 1957 : 227). This fact is probably to be linked with Boycott's (1934 : 18) observation that the young are exceptionally uncommon. Beyond this, I have been able to discover nothing.

A partial explanation of the British distribution is provided by the rather surprising fact that *Abida secale* was among the first 20 or so land snails to reach southern England during the retreat of the Last Glaciation, and, at least on the Chalk of the south east, it was already abundant during the latter part (Zones II and III) of the Late-glacial Period, that is, by about 9,500 B.C. The open and relatively treeless landscape of that time proved most congenial; then, with the general improvement of climate at the beginning of the Post-glacial, about 8,000 B.C., which rapidly gave rise to a continuous forest cover, its habitats were destroyed and it became extinct in most of the places where before it was abundant, and has usually remained absent to this day.

I think it is therefore likely that the present-day distribution of *Abida secale* in Britain is essentially a relict one. It was able to survive on coastal cliffs in the south and west, probably in the form of colonies slowly retreating before the rising and encroaching sea,

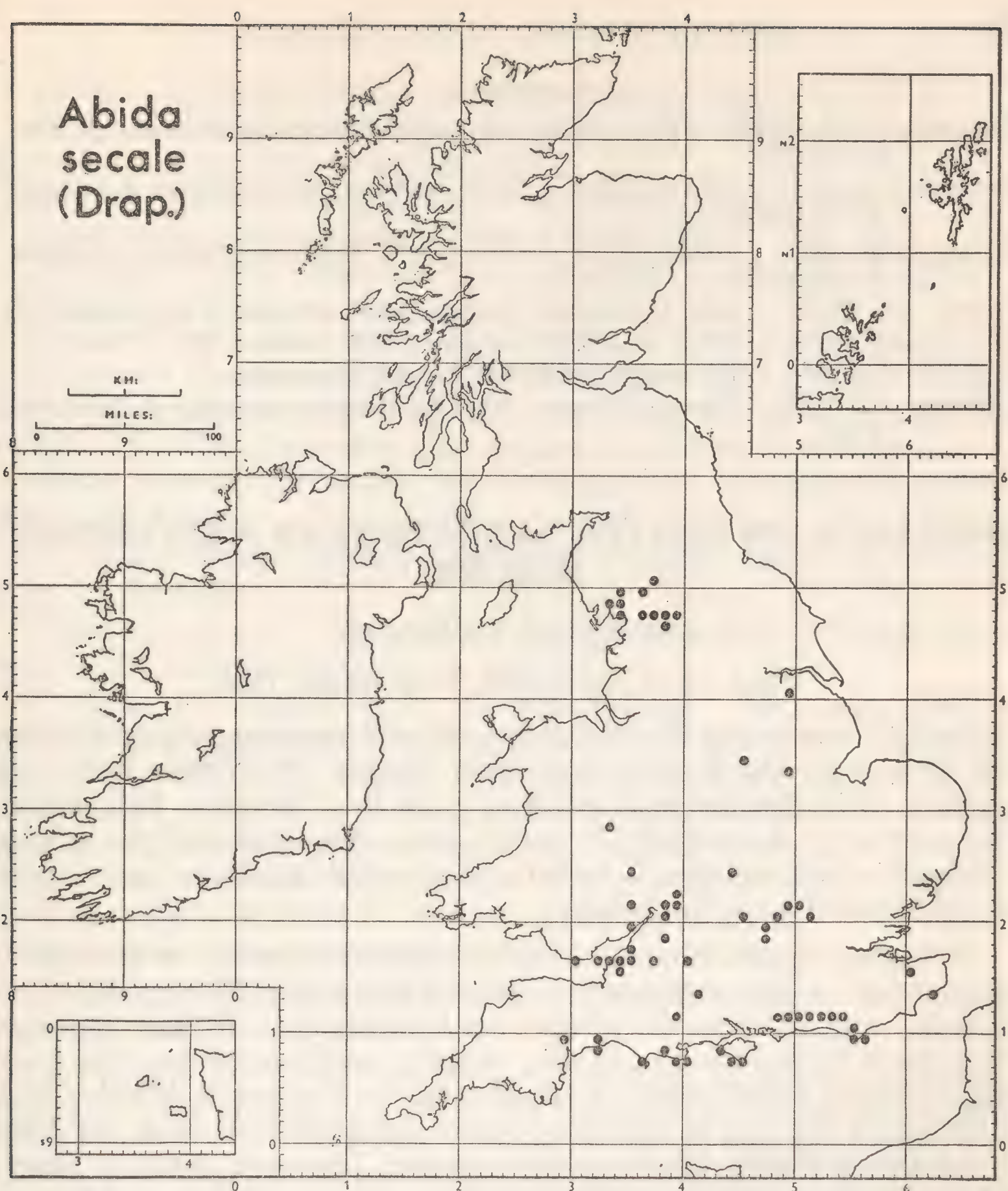


FIG. 1. Known British distribution of *Abida secale* (Draparnaud).

and also in favoured inland areas which escaped dense forestation, such as the Dale country of Westmorland and Yorkshire (cf. the arguments of Godwin (1956 : 319-22) for the local survival through the Post-glacial of characteristic Late-glacial flowering plants in Teesdale and similar refuges). Elsewhere, its habitats probably represent chance secondary recolonization in the wake of the clearances made by man from later prehistoric times onwards. If this theory be correct, recolonization has clearly been rather inefficient when contrasted with the original rapid spread of this species in the Late-glacial Period, or with the spread since the Roman Era of such alien anthropophiles as *Helix aspersa* and *Monacha cantiana*.

The apparent failure of *Abida secale* to reach Ireland is puzzling in view of its early arrival in England; it may yet be found fossil there.

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MOLLUSCA ON BUNTER SANDSTONE IN A LIVERPOOL SUBURB

By NORA F. McMILLAN

(Read before the Society, 16 December 1961)

Boycott once urged the desirability of working unpromising districts for Mollusca: the Bunter Sandstone division of Triassic rocks, on account of its deficiency of calcium carbonate, certainly falls within this category. Accordingly it seems worth while to record the species obtained in such an area, in order to show which Mollusca can tolerate so uncongenial an environment.

As Liverpool spread outwards in the nineteenth century, small estates, surrounded by high sandstone walls, were created on the dry, drift-free uplands, and in these the prosperous business men of those spacious days dwelt in profusion of family, servants and possessions. Such an establishment was Carnatic Hall, situated on the top of Mossley Hill (188 feet O.D.), and in this late-Victorian red-brick mansion, the City of Liverpool Public Museums were housed for some post-war years. The grounds, comprising some woodland, a large paddock, and flower, fruit and rock gardens uncultivated since 1941, occupy $15\frac{1}{4}$ acres. Conditions could hardly be less favourable for land Mollusca: a high, dry site on the inhospitable Pebble Beds of the Bunter Sandstone, on which is deposited the grime of a great city. Nevertheless a total of 15 species was obtained between 1955 and 1960, during which period I worked at the Museums and sometimes employed the lunch hour in searching for Mollusca. The following are the species found in the grounds of Carnatic Hall.

Cochlicopa lubrica (Müller): three in 1957, one in 1959; all *det.* H. E. Quick.

Discus rotundatus (Müller): fairly frequent. An albino, with both shell and "animal" pure white except for the eyes, a normally coloured animal with white shell, and several var. *turtoni* Fleming were taken on 11 September, 1957.

Vitrea crystallina (Müller): one, 23 October, 1959.

Oxychilus alliarius (Miller): half a dozen, 1955, 1957; var. *viridula* Jeffreys, two taken on 19 March, 1956.

Retinella nitidula (Draparnaud): occasional, 1955, 1957.

Arion intermedius Normand: one, 4 April, 1957.

A. circumscriptus Johnston: four, April, 1957; one, March, 1959.

A. hortensis Férussac: frequent.

A. ater (L.): one in the summer of 1955. Two or three specimens were turned down in 1956 and on 25 October 1959 a batch of eggs which appear to be those of *A. ater* was found, but unfortunately not reared. Possibly the species now occurs somewhere in the area.

Milax sowerbyi (Férussac): one fine specimen, 11 September, 1957; det. H. E. Quick.

M. budapestensis (Hazay): frequent, specially about the rockery close to the house.

Limax maximus L.: two under a log, 5 September, 1957, and often seen in the same place for some months.

L. flavus L.: usually about the outbuildings. Numerous feeding tracks which were observed on the upper 2 to 3 feet of the 7 feet high boundary wall on 14 August, 1959 seemed to belong to this species (see Adams, L.E., 1912, *J. Conch.*, **13**: 321). This part of the wall was shaded by trees and covered with a green growth, presumably algal. No tracks were found on the lower part of the wall, which suggests that the slugs lived in crevices of the upper part.

Agriolimax reticulatus (Müller): frequent; det. H. E. Quick.

A. caruanae Pollonera: fairly frequent, especially about the derelict pig-sties; det. H. E. Quick.

In addition to the above species, a *Testacella*, of which I have not yet obtained a specimen, lives in the garden of a nearby house, and single examples of *Oxychilus cellarius* (Müller) and *O. draparnaldi* (Beck) were taken in the garden of "Sudley," also close by. In June, 1957 eight individuals of *Helix aspersa* Müller, 3 adults and 5 half-grown, were released in the grounds of Carnatic Hall, but none was seen subsequently.

Of the species listed above, the following are characteristic garden species and were probably introduced by human agency: *Oxychilus draparnaldi*, *Arion hortensis*, *Agriolimax caruanae*, *Milax* spp. and *Testacella*. The status of *Limax flavus* is indeterminate; it lives about older houses throughout Merseyside, but may not be native in north-west England.

Boycott (1934, *J. Ecol.*, **22**: 33) remarks, "I am not sure that the three sorts of *Testacella*, *Limax flavus*, *Milax sowerbii* and *M. gracilis*—all domesticated species—are found away from calcareous surroundings." Three samples of soil from the grounds of Carnatic Hall when tested with 20% hydrochloric acid proved to be non-calcareous in Boycott's sense, that is with less than 0.5% calcium carbonate.

NOTES ON THE GENUS *ACAUVUS* MONTFORT

By G. A. S. BARNACLE

The genus *Acauvus* Montfort is restricted to Ceylon, and the various species abound in the wet area to the west and south of the central mountain massif, extending through the foothills to an elevation of about 2000 ft.; only one species, *skinneri* (Reeve), being an exception to this, having its habitat in mountain jungles at an elevation of some 4500 to 6000 ft.

The species are all large and generally beautifully coloured, and all are arboreal except two, for which the subgeneric name *Oligospira* was proposed by Ancey (1887).

Sykes published a short paper (1900) on the arrangement of the various species, a short summary of which is as follows:—

Acauvus haemastoma (Linnaeus), the type species.

varieties:—*melanotragus* (Born).

conus (Pilsbry).

concolor (Pilsbry).

Acauvus prosperus (Albers)) Both strongly suspected to be

Acauvus fastosus (Albers)) only varieties of *haemastoma*.

Acauvus phoenix (Pfeiffer).

Acauvus superbus (Pfeiffer).

varieties:—*grevillei* (Pfeiffer).

roseolabiatus (Nevill), which Sykes states "is a remarkable variety and indeed may prove to be distinct."

Acauvus waltoni (Reeve)) The species comprising

variety:—*polei* Collett) the subgenus

Acauvus skinneri (Reeve)) *Oligospira* Ancey.

The genus is oviparous, the eggs being symmetrically oval and about 20 x 13 mm. The arboreal species seem to be very sensitive and, on being touched, exude copious watery mucus and fall to the ground, many being found badly damaged and even holed by the rough and stony ground on which they fall. This non-adhesive quality probably accounts for their limited range, unlike adhesive species such as *Achatina fulica* (Férussac) or *Helix aspersa* Müller, which are known to be dispersed with vegetables or other merchandise.

In their natural state the arboreal species are generally covered with a greenish deposit, undoubtedly caused by the rain water carrying a certain amount of the green alga from the trunks of the trees on which they live, which becoming mixed with the slime of the snails is deposited on the shells.

However, it is noticeable that those shells found in sheltered spots, such as hollow trees or under bunches of fern or orchids on the trees and thus protected from the rain water, show no sign of the green deposit but retain their natural colours. These shells are found in all stages of growth, many being fully adult, which proves that they

must have spent all their lives in such sheltered positions and therefore must return to the same spot after feeding on the herbage round the trees. This homing instinct does not seem to have been noticed by previous authors, and it is interesting to speculate whether other genera, where the proof is not so incontestable, have a similar habit.

Another peculiarity of this genus is that the several species are not found in association, each having its separate area. This leads to the strong belief that *prosperus* and *fastosus* are merely varieties of *haemastoma*. In a large series of the shells collected in any particular spot, it is possible to pick out specimens of any of the varieties as well as intermediate forms. In fact it is more likely that the black-lipped variety *melanotragus* is a separate species, as this form is not found in association with the true red-lipped *haemastoma*, the type of the species. In general, the variety *concolor* is found in association with the red-lipped *haemastoma*, and the varieties *conus*, *fastosus* and *prosperus* in association with the black-lipped *melanotragus*.

The above peculiarity of separate habitats of the several species also leads to the reverse argument that the so-called variety *roseolabiatus* of *superbus* is not in fact a variety of that species, but entirely distinct. *Roseolabiatus* is not found in the *superbus* area; in fact the areas inhabited by each are separated by a range of mountains including Adam's Peak, 7360 ft., and several large rivers and valleys. *Roseolabiatus* is somewhat larger than typical *superbus* and the peristome is more broadly expanded, with the columella plate abruptly truncated at the base. Moreover it never shows the distinctive "Obliquely descending malleations, a feature lacking in the other species" (Gude, 1914, 50) on the back of the body whorl, which *superbus* invariably has, and which are easily discernible even on the most worn specimens; and it always exhibits the brilliant deep rose coloured peristome, parietal callus and columella plate to which no other species ever attains, except perhaps some especially dark red lipped specimens of *haemastoma*, from which it is readily separated by other distinct characteristics. *Superbus* never occurs with even the faintest trace of pink or rose colour in the lip.

The only other species with which *roseolabiatus* might be confused is *phoenix* from which it is again separated by the invariable deep rose colour of the lip, that of *phoenix* varying from the typical black through various shades of brown to a pale pink or pure white. *Roseolabiatus* has a less globose body whorl than *phoenix*, is generally larger with a more broadly expanded peristome, and there is a distinct angulation at the periphery which *phoenix* lacks. Although its habitat adjoins that of *phoenix*, the two species are not found in association and it is noticeable that the river Kelani forms the boundary for a considerable distance on the northern side.

Anatomically, Randles (1900) states that the radula, in common with *superbus* and *grevillei*, is stouter and broader than *haemastoma*, and the teeth number from 101-105, whereas those of *phoenix*

number from 105-117.

The conclusion is that *roseolabiatus* is not a variety of *superbus* by reason of habitat, lack of malleations, and colour of lip, and that it differs sufficiently from *phoenix* in shape, habitat, uniformity in colour of lip, and in the radula, to be elevated to specific rank.

The remaining species, *waltoni* and *skinneri* are distinctive forms, and comprise the subgenus *Oligospira* Ancey. They are terrestrial, found under leaves and rotting vegetation, and do not exhibit any of the greenish deposit which usually covers the arboreal species. There is, however, a variety of *waltoni* figured and described by Collett (1899) under the name *polei* with habitat in the Southern Province. The only characteristics distinguishing it from typical *waltoni* appear to be the white peristome and parietal callus, but Collett mentions that it is sometimes found with the greenish deposit similar to other species, which seems to point to its being an arboreal species. Certainly, the only two specimens taken by the present author were on trees about six feet above the ground in heavy jungle at some 1000 ft. elevation near Rakwana, in the south-eastern part of Sabaragamuwa Province, which adjoins the Southern Province. Randles (1900) states that the difference in structure of the penis is sufficient to justify a separate species, but until further material can be obtained the status of this variety must remain in abeyance. The species *waltoni* occurs in all the areas in which the other species are found except *skinneri*, which inhabits an exclusive area at high elevation.

In the light of the foregoing remarks, the genus should be regrouped as follows:—

Acavus haemastoma (Linn.) Type.

varieties:—*melanotragus* (Born).

conus (Pilsbry).

concolor (Pilsbry).

prosperus (Albers).

fastosus (Albers).

Acavus phoenix (Pfeiffer).

Acavus superbus (Pfeiffer).

variety:—*grevillei* (Pfeiffer).

Acavus roseolabiatus (Nevill) Barnacle.

Acavus (Oligospira) waltoni (Reeve).

variety:—*polei* Collett.

Acavus (Oligospira) skinneri (Reeve).

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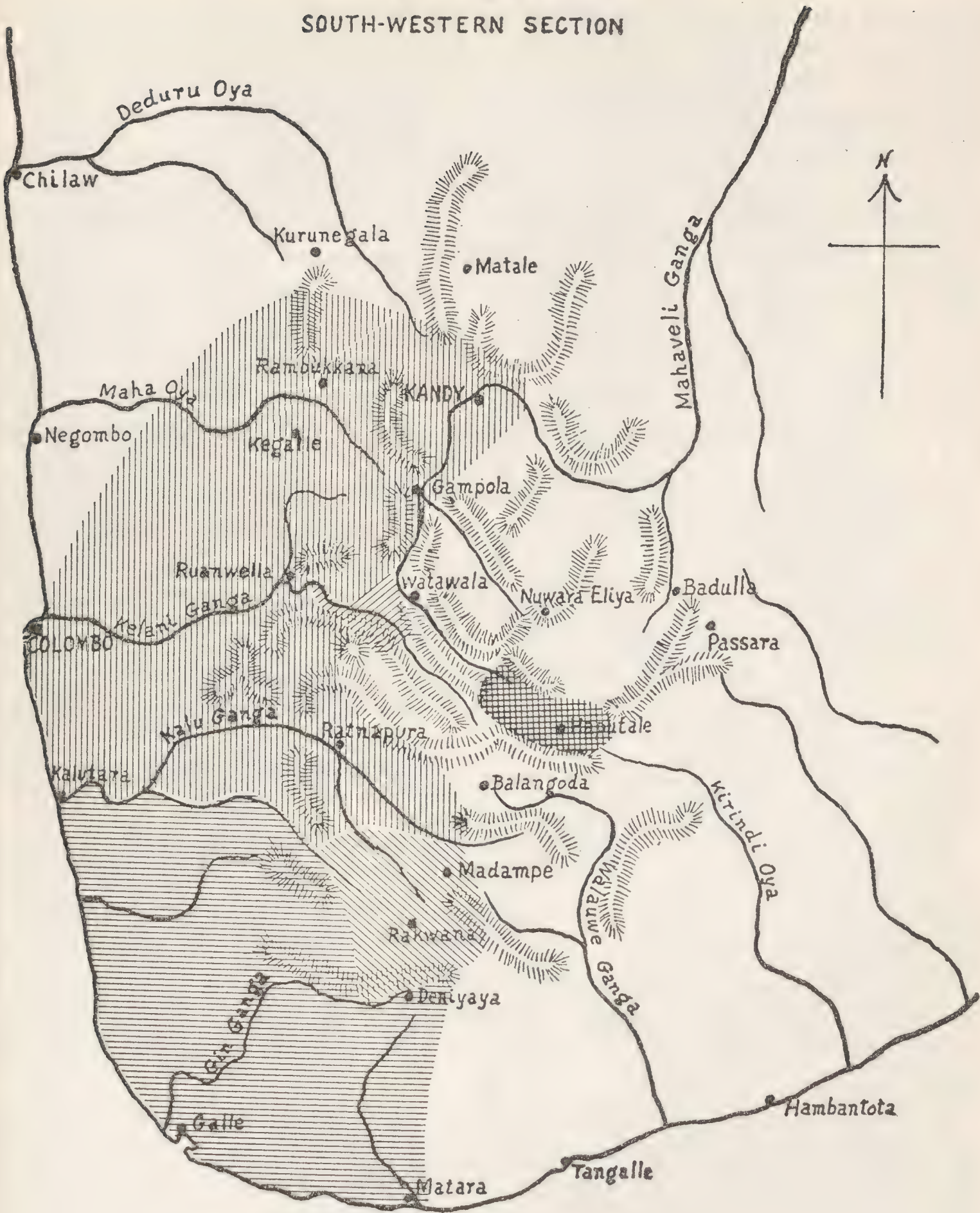
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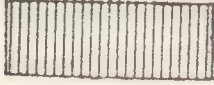
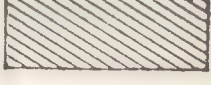
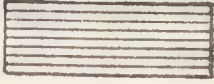
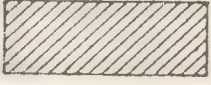
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CEYLON
SOUTH-WESTERN SECTION



Approximate distribution of species of
genus *Acavus* Montfort.

<i>Acavus phoenix</i> Pfr.		<i>Acavus superbus</i> Pfr. & var. <i>grevillei</i> Pfr.	
<i>Acavus haemastoma</i> Linn. & vars. <i>conus</i> Pils., <i>concolor</i> Pils., <i>melanostragus</i> Born, <i>fastosus</i> Albers, <i>prosperus</i> Albers.		<i>Acavus roseolabiatum</i> Nevill.	
		<i>Acavus skinneri</i> Rve.	

OBITUARY

HARRY BEESTON, 1865 - 1962

The passing of Harry Beeston on 10 January, 1962 deprived the Society of one of its oldest members, for he joined in 1901. In actual age too he was one of our oldest members, having been born on 2 March, 1865, at Market Drayton, Shropshire, thus being in his 97th year when he died.

Beeston was a schoolmaster by profession and held several appointments, one of which was that of headmaster of Rothwell, Northamptonshire. Later, in 1896, he was made headmaster of a school in Havant, Hampshire, and on retirement continued to live at "Sunny-mead," South Street, till his death. Our portrait shows him as he was at 85 years of age. Another photograph of him appeared in Taylor's *Monograph of the land and freshwater Mollusca of the British Isles*, volume 4, page 64, where he is associated by the author with *Helicodonta obvoluta* (Müller), of which Beeston made a special study.

In 1888 Harry Beeston married Miss Betty Daniels, who died in 1939. In June of the following year he married Mrs. Ellen Amelia Palmer, a daughter of Charles East Wright of Kettering, himself a well-known member of the Conchological Society, and she survives him. Unfortunately Beeston had no children to inherit his love of natural history and his collections. These latter have now been disposed of. He was a good all-round naturalist of the old school, of whom there are too few in these days of specialisation. Besides his remarkably well arranged collection of shells he had good collections of bird's eggs and insects.

His collection of bird's eggs has been acquired by Mr. Wheeler of Fareham, and, judging from his library, Beeston's first love was probably birds. He contributed a number of notes to well-known journals. His collection of shells is now with Mr. T. P. Wimbledon, Leigh Park, Havant. His collection of butterflies has been given to the Boys' School at Warblington, Hants. His Mollusca library, which was small but useful, has been disposed of to members of our Society.

Beeston's writings on Mollusca were not extensive, but his "Land and freshwater Mollusca of Grange-over-Sands" appeared in Volume 12 (1908 and 1909) and ran into 25 pages; a very fine survey of a limited area. An "Addenda to Grange Mollusca" of 2¼ pages appeared later in the same volume. There was also "West Lancashire non-marine Mollusca: Morecambe and District" in Volume 11 (1906), but this was a shorter work occupying only 4½ pages. In 1904 he had collaborated with his future father-in-law, C. E. Wright, in producing "The land and freshwater Mollusca of Ilfracombe and District," which was also published in this *Journal* (Volume 11).

So far as we have been able to ascertain, he published nothing on Mollusca in any other journal; he was not a member of any other scientific society. Although he had been in failing health for some time he continued to the end to have a lively interest in natural history.

H. E. J. BIGGS



J. B. Beeston.

[facing page 132

AUSTROBORUS PARODIZ, A NEW NAME FOR MICROBORUS PILSBRY

By T. PAIN

(Read before the Society, 19 May, 1962)

The subgeneric name *Microborus* was proposed by Pilsbry (1926, 61) for a group of small Strophocheilidae inhabiting Uruguay and northern Argentina. Parodiz (1949, 189) has, however, pointed out that the name *Microborus* is preoccupied, having been used by Blanford (1897, *Biologia Centrali Americana*) for a group of beetles of the family Scolytidae. This was unknown to Bequaert, who in his monograph on the Strophocheilidae (148, 167) retained Pilsbry's name. As a substitute name Parodiz proposed *Austroborus*, with type species *Bulinus lutescens* King & Broderip, 1832. It is unfortunate that this change of name, to which it is the purpose of the present note to draw attention, was published in Spanish in an obscure South American journal.

Like other subgenera of *Strophocheilus*, *Austroborus* seems to be best characterized by the sculpture of the nepionic whorls. In this subgenus this consists of fine, close-set, vertical, raised lines, cut by many spiral impressed lines into minute granules. In addition to the type species, the following are referred to *Austroborus*: *S. d'orbignyi* (Döring) and *S. cordillerae* (Döring).

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PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

**796th Meeting, held at the British Museum (Natural
History), 14 April 1962**

The President, Mr. L. W. Stratton, in the chair.

Members Elected

N. A. Holme, M.A., The Laboratory, Citadel Hill, Plymouth.
 Lt. Commander M. C. M. Smith, R.N., 2 Castleway, Havant,
 Hampshire.

Communication

"*Pila letourneuxi* (Bourguignat), its synonymy and distribution," by
 T. Pain.

Exhibits

Special exhibit: Pholadidae, introduced by Mr. D. Heppell; examples were also shown by the President and Mr. C. P. Castell (from the British Museum collections).

Mrs. E. M. Crowley: shells from Poole, Dorset.

Major P. K. Earle: *Cyprina islandica* (L.) from 2 to 3 miles south of Porthcurnow, Cornwall, and *Mercenaria mercenaria* (L.) from Southampton Water, 1961.

Mr. T. Pain: specimens to illustrate his paper; also *Lanistes nyassanus* Smith.

Mr. F. R. Woodward: *Conus gloria-maris* and *Pleurotomaria beyrichi* from the Department of Zoology, University of Glasgow.

797th Meeting, held at the British Museum (Natural History), 19 May 1962

The President, Mr. L. W. Stratton, in the chair.

Members Elected

Dr. J. A. Allen, Dove Marine Laboratory, Cullercoats, Northumberland.

J. Cooper-Poole, The R.A. Mess, Woolwich, London, S.E.18.

Miss Enid I. Harvey, 40 High Street, Padstow, Cornwall.

Museu Rio-Grandense de Ciências Naturais, Praça Dom Feliciano, 78-Caixa postal 1188, Pôrto Alegre, Rio Grande do Sul, Brasil (Director, Prof. Dr. Ludwig Buckup).

Peter Edwin Negus, 82 Chelsea Gardens, Chelsea Bridge Road, London, S.W.1.

Miss Joan Rosling, 344 Camp Road, St. Albans, Herts.

D. H. Wintsch, M.A., A.M.I.C.E., 11 The Avenue, New Romney, Kent.

Communication

"*Austroborus* Parodiz, a new name for *Microborus* Pilsbry," by T. Pain.

Exhibits

Special exhibit: Mollusca of sand dunes. Mr. J. F. Peake gave a lecture on sand dunes and their snails, illustrated by colour transparencies.

The President: snails characteristic of sand dunes.

Mrs. Helen Boswell: particularly fine perfect specimens of *Tibia fusus* from Manila, Philippine Islands.

Mr. C. P. Castell: *Helix nemoralis* var. *ponderosa* Malm, Dog's Bay (Holocene) Connemara; shells from the blown sands and associated deposits of Towan Head, near Newquay, Cornwall (see Kennard, A. S., & Warren, S. H., 1903, *Geol. Mag.*, Decade 4, Vol. 10, No. 463, pp. 19-25).

Mr. J. Cooper : *Testacella scutulum*, Dorking, Surrey, R. W. Ashford; *Limax cinereo-niger*, Darwin's Bank, Downe, Kent West.

Mr. T. Pain : types of subgenera in the family Strophocheilidae.

Mrs. N. F. McMillan : examples of *Pholas* and *Zirfaea*.

Mr. R. P. Scase : rare shells from Japan and Hawaii, including : *Murex pele*, *Pleurotomaria hirasei*, *Voluta tibiaeformis*, *Guilfordia yoca* and *G. triumphans*.

Mrs. Alice Wilkins : water colours of *Pholas* and other Mollusca by the late G. L. Wilkins.

Mr. F. R. Woodward : *Cypraea guttata* (Royal Scottish Museum).

REVIEWS

South Australian Mollusca: Pelecypoda. BERNARD C. COTTON.

Handbooks of the Flora and Fauna of South Australia. Adelaide : W. L. Hawes, Government Printer. 1961. Price 24s. 6d. Pp. 363; 351 text-figures.

This handbook is a revision of *The Molluscs of South Australia* by B. C. Cotton and F. K. Godfrey (1938). It is essentially a conchologists' handbook to the bivalves of South Australian waters of the Flindersian Province. The collector will find it a very useful compilation, listing, describing and illustrating all the species hitherto found in the area. The descriptions are given in telegraphic style, with remarks on distinguishing features, and the known localities are noted. Each generic diagnosis is followed by a key to South Australian species. The figures of the shells, from drawings or photographs, are of excellent quality, but only rarely are anatomical features given. The introductory chapters have been rewritten on more systematic lines and the keys to orders, superfamilies and families have been grouped together in more accessible form. A few additional species are included, but an interesting section on local edible bivalves is omitted from this edition.

Surprisingly, *Edenttellina* Gatliff and Gabriel is still included, although as the author states this has been shown to be a Gastropod; presumably the description is retained to help the amateur to identify the shell. A new fifth chapter lists all the species and gives references to the publications in which the original descriptions appeared. When the type specimens are in the South Australian Museum this is also noted. There is a good list of regional references and a complete index.

The Editor has asked me to point out that the convention of citing the name of the author of a species in parentheses, when the species has been transferred from the genus under which it was originally described, is not observed in this book.

W. J. REES.

Sea Shells of the World. A guide to the better-known species.

R. TUCKER ABBOTT, Ph. D., under the editorship of HERBERT S. ZIM, Ph. D. Illustrated by GEORGE and MARITA SANDSTRÖM. Pp. 160; 790 illustrations in colour of 562 species. 6 x 4 inches. Golden Nature Guides, Golden Press, New York. De Luxe Library edition \$3.50. Limp-bound \$1.00. March, 1962.

Described as "a guide to the better-known species," this little book, intended primarily for the amateur, will be welcomed by all interested in marine conchology. It contains much information in condensed form, together with family trees of gastropods and bivalves and maps of some marine provinces. The illustrations are excellent and quite adequate for identification. Each is accompanied by the popular and scientific names and the general distribution. Most of the species are not difficult to obtain, while some of the more celebrated rarities are also figured. A slight criticism is that the figures are generally paler in colour than the actual shells and some have an unnatural greenish tinge. It may be thought that excessive space (33 pages), has been devoted to those popular groups the cowries, cones and volutes, and that more might well have been given to the bivalves, some of which, e.g. piddocks and dog cockles, are entirely omitted. Perhaps the author can be persuaded to remedy this deficiency in a second volume or a new edition. This book can be thoroughly recommended, its remarkable cheapness bringing it within reach of all.

L. W. STRATTON.

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Conchological Society of Great Britain and Ireland

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[No. 4

NOTES ON THE GENUS *DYAKIA*, WITH A LIST OF THE SPECIES

By F. F. LAIDLAW

(Read before the Society, 20 October, 1962)

DYAKIA Godwin-Austen (1891, 29), type species, by original designation, *Helix hugonis* Pfeiffer, 1863.

Existing lists of the species of *Dyakia*, of which the most recent is that of Laidlaw (1931), are not critical and include species now transferred to other genera. The distribution and range of variation of the various species is still imperfectly known and the synonymy sometimes obscure. In some cases the relegation of named forms to the position of a synonym has perhaps been used as an easy way out of a perplexity. The following list is not claimed to represent a final judgment on the correct arrangement of the species, but rather is intended to be some guide to the status of the forms included in the genus at the present time and to clarify some of the confusion which exists concerning them.

Dyakia is the eponymous genus of the subfamily Dyakinae Gude, 1921 (Dyakiinae Laidlaw, 1931) of the family Zonitidae [Thiele, 1931, places *Dyakia* in the family Ariophantidae, subfamily Xestinae]. The shell is usually sinistral, occasionally amphidromous, generally dull corneous or straw-coloured, with a narrow darker zone near the periphery. A few species have spiral bands of a deeper colour on the upper part of the shell, which is of medium or rather large size (about 25 to 45mm. in diameter), depressed pyramidal or turbinate, often carinate in the adult and usually so in young shells, though the keel in some species may disappear behind the aperture. The whorls in many species are closely coiled (up to 7 or $7\frac{1}{2}$ whorls), the umbilicus similar in all species, narrow and slightly obtect. The surface of the shell is finely striate with radial lines of growth; the striae may tend to be bunched in some forms.

The foot sole is not divided or but slightly so and shell-lobes are lacking from the mantle. The radular teeth are unicuspid. The amatorial organ consists of a proximal glandular part not enclosed in the muscular sac which contains the calcareous dart, but connected with it by a long, tubular, much convoluted duct. Burrington Baker (1941) suggests that this is a primitive condition and that in most Ariophantini the glandular part has become enclosed in the muscular sac and provided with a retractor muscle. The spermatheca opens into the distal part of the dart-sac.

Dyakia is related to *Asperitas* Gude, *Elaphroconcha* Gude, *Everettia* Godwin-Austen, *Kalamantania* Laidlaw, *Quantula* Baker, *Rhino-*

cochlis Thiele, *Sasakina* Rensch and perhaps *Ariophantopsis* Rensch. It is found in Lower Burma and Siam and is richly developed in Sundaland. It does not cross Wallace's Line, but Möllendorff records a single species from Formosa.

It is impossible in many cases to be sure how far the local populations of a named form differ from one another, or to what extent individuals within such a population may vary. From what evidence I have it seems likely that shells of a given form collected in the same area are generally alike, whilst shells regarded as belonging to the same form or "species" from some other area differ to an appreciable extent in such characters as colour, height of spire and size. It is therefore difficult to deal with the synonymy of a number of the species, especially as the amount of variation in any local population is still in need of assessment. I have accordingly refrained from relegating several doubtful species to synonymy.

The species can conveniently be arranged in groups on conchological characters, briefly defined below :

A. Group of *D. hugonis* : generally sinistral, dextral individuals exceptional ; shell closely coiled, depressed pyramidal, periphery sharply keeled and bevelled below so as largely to obliterate the suture of the succeeding whorl ; lower surface not globose. Restricted to Borneo. Species : *busanensis*, *densestriata*, *hugonis*, *intradentata*, *janus*, *mindaiensis*, *regalis*.

B. Group of *D. mackensiana* : shell closely coiled, depressed pyramidal or turbinate ; dextral individuals frequent in some species ; periphery keeled or shouldered, but not so acutely as in the *hugonis* group ; rather globose below the periphery and the keel may disappear before the aperture ; suture feebly impressed. Malayan forms : *kin-tana*, *mackensiana*, *sannio*. Sumatran forms : *maarseveeni*, *weyersi*.

C. Group of *D. rumphii* : shell less closely coiled, depressed turbinate, not keeled (except *clypeus*), always sinistral (?). Sumatran forms : *euconus*, *foveata*, *granaria*, *sumatrensis* (?), *smithiana*. Javanese forms : *clypeus*, *rumphii* (occurs also in southern Sumatra).

D. Position doubtful : Burmese and Siamese forms : *retrorsa*, *salangana*. These have a spiral wrinkling of the surface of the shell unlike the radial striae of other species of *Dyakia* ; like the following species they are sinistral. Malayan form : *lahatensis*. Formosan form : *taivanica* ; looks like a *Dyakia*, but requires further investigation.

The following species, at one time included in the genus *Dyakia*, have now been transferred to other genera :

Helix cidaris Lamarck, 1822 : *Asperitas* Gude, 1911 (Rensch, 1931).

Dyakia godwinausteni Laidlaw, 1931 : *Quantula* Baker, 1941.

Helix javacensis Férussac, 1821 (= *H. javanica* Férussac, 1821 ; *H. umbilicaria* le Guillou, 1842 ; *Nanina javana* Martens, 1867 ; *N. desgrazii* Tryon, 1886) : *Elaphroconcha* Gude, 1911 (Jutting, 1950).

Helix martini Pfeiffer, 1854 : *Elaphroconcha* Gude, 1911 (Jutting, 1959).

Helix nasuta Metcalfe, 1851 (= *Dyakia moluensis* Godwin-Austen, 1891) : *Rhinocochlis* Thiele, 1931.

Helix nemorensis Müller, 1774 (= *Asperitas trochus pseudonemorensis* Rensch) : *Asperitas* Gude, 1911 (Rensch, 1932).

Helix rareguttata Mousson, 1849 ; *Asperitas* Gude, 1911 (Rensch, 1932).

Helix ryssolema Albers, 1852 (= *Nanina thyreus* Benson, 1852) : *Ariophanta* des Moulins, 1829 (Jutting, 1950).

Nanina striata Gray, 1834 (= *Helix naninoides* Benson, 1842) : *Quantula* Baker, 1941.

ALPHABETICAL LIST OF SPECIES

Dyakia busanensis Godwin-Austen.

Dyakia busanensis Godwin-Austen, 1891, 31, 1906, 96 ; Smith, 1895, 103 ; Martens & Thiele, 1908, 261 ; Laidlaw, 1931, 191.

Dyakia busauensis Gude, 1903, 57.

Holotype (1891. 3. 9. 5) in the British Museum (Natural History). North Borneo.

Shell depressed, rather lenticular, sharply keeled, suture not impressed ; upper surface finely striate, lower surface polished ; whorls $5\frac{1}{2}$. Diam. max. 21mm., alt. 11mm. Dull white, usually with a single band of orange-brown at the periphery. This description is based on a number of specimens in the Royal Scottish Museum. Var. *concolor* Smith, 1895, is almost uniformly dull brownish. The figure given by Godwin-Austen (1891, pl. 2, fig. 1) does not depict *busanensis*, as stated in the text, but *hugonis*.

Dyakia clypeus (Mousson).

Nanina clypeus Mousson, 1857, 156 ; Martens, 1867, 227 ; Pfeiffer, 1870, 27, pl. 115, figs. 3-5 ; Tryon, 1886 : 20, pl. 3, figs. 39, 40 ; Tenison-Woods, 1888, 1025.

Dyakia clypeus Gude, 1903, 54 ; Schepman, 1912, 231 ; Leschke, 1914, 227 ; Laidlaw, 1931, 191 ; Paravicini, 1935b, 172 ; Jutting, 1950, 424, figs. 40, 41 ; 1959, 157.

I agree with Jutting that Rensch (1934, 748) is not justified in synonymising *clypeus* with *rumphii*.

East Java (type locality Mt. Smiron) more recently extending into West Java.

Upper surface of shell flat, discoid, periphery keeled, lower surface globose ; whorls about 5 ; suture not impressed ; aperture lunate ; upper surface striate and malleate ; straw-coloured, nearly uniform. Diam. max. 35mm., alt. 16mm.

Dyakia densestriata Schepman.

Dyakia densestriata Schepman, 1896, 154, pl. 3, fig. 2a-c ; Gude, 1903, 57 ; Martens & Thiele, 1908, 261 ; Rensch, 1934a, 328.

Dyakia venator Gude, 1915 ; Rensch, 1934a, 328.

Rensch identifies *venator* with *densestriata* and regards both as being closely related to *martini*.

Type in Leiden Museum. Borneo (Mt. Liang Gagang ; Mt. Tiloeng ; Sintang—Schepman). The holotype of *venator* (1922. 8. 29. 17) in the British Museum (Natural History).

Schepman gives the dimensions as diam. max. 37mm., min. 33mm., alt. 19mm., and notes that one dextral specimen was collected at Mount Liang Gagang. "The nearest allied species, as far as concerns shape, seems to be *Nanina* (*Dyakia*) *Janus*, as figured by v. Martens (Ostas. Landschn. pl. 11, fig. 4), but the last whorl in that species is broader, the upper margin of the aperture is consequently longer and seems to be less curved, and the sculpture is different." There can be no doubt that it is one of the *janus* complex, but how far it is distinguishable from other members of the complex is a matter for future study.

***Dyakia euconus* Sykes.**

Dyakia euconus Sykes, 1905, 228, fig. 1 ; Degner, 1928, 356 ; Laidlaw, 1931, 191.

Syntypes (1930. 9. 12. 69-70) in the British Museum (Natural History). West Sumatra. Closely related to and probably synonymous with *granaria*.

Shell described by Sykes as trochiform, with well marked suture, whorls 6, aperture subquadrate, horn-coloured, striae irregular lines of growth, later whorls with a large number of closely set, fine spirals. Diam. max. 36mm., alt. 24mm.

***Dyakia foveata* (Pfeiffer)**

Helix foveata Pfeiffer, 1853b, 126 ; Reeve, 1854, pl. 184, fig. 1272.

Nanina foveata Bock, 1881, 628 ; Tryon, 1886, 20, pl. 3, fig. 41.

Dyakia foveata Gude, 1903, 52 ; Degner, 1928, 356 ; Rensch, 1934a, 329.

Distribution : Gude and Degner give Sumatra, Pfeiffer gives India ; two specimens in the British Museum (Natural History) are labelled ?Java.

The specimens in the British Museum (Natural History) are sinistral, with about 6 whorls, depressed turbinate ; periphery angled, but becoming less so towards the aperture ; suture feebly impressed, aperture lunate ; upper surface regularly malleated from the second whorl, rather as in *D. clypeus*. Diam. max. 40mm., alt. 23mm. This species is related to *D. rumphii*.

"The locality 'India' must be regarded in the sense in which it was formerly used, as applying to the East Indies and not to British India only" (Smith, 1887a, 132).

"The Indian species *Dyakia foveata* (Pfeiffer) has some superficial resemblance to *D. clypeus* (Mousson). Therefore it is not impossible that Bock took the two specimens from Sidjoendjoeng for *D. foveata* instead of *D. clypeus*. Unless the original material can be compared no definite solution is possible" (Jutting, 1959, 157).

Dyakia granaria (Bock)

Helix (*Nanina*) *granaria* Bock, 1881, 628, pl. 55, fig. 1.

Nanina granaria Tryon, 1886, 18, pl. 2, fig. 24.

Nanina (*Hemiplecta*) vielleicht *granaria* Martens, 1900, 8.

Dyakia granaria Gude, 1903, 52 ; Sykes, 1905, 227 ; Degner, 1928, 342 ; Laidlaw, 1931, 191 ; Jutting, 1959, 154.

Nanina (*Dyakia*) *granaria* Kobelt, 1901, 1009, pl. 261, fig. 11.

Ariophanta granaria Bullen, 1906, 126 ; Rolle, 1908, 64.

Hemiplecta amphidroma van Heurn & Paravicini, 1922, 29, fig. 5.

Sumatra (type locality Mount Sago). Closely related to *euconus* and *smithiana* ; if the three species should be united, *granaria* is the earliest name.

Dyakia hugonis (Pfeiffer)

Helix hugonis Pfeiffer, 1863, 523.

Helix sinistra Bonnet, 1864, 67, pl. 5, fig. 2.

Nanina hugonis Martens, 1867, 225 ; Issel, 1874, 393 ; Tenison-Woods, 1886, 1024, pl. 30, fig. 23. Tryon, 1886, 18, pl. 2, figs. 27, 28.

Dyakia hugonis Godwin-Austen, 1891, 29, pl. 5, fig. 5 ; Smith, 1894, 454 ; Wiegmann, 1898, 406 ; Gude, 1903, 61 ; Godwin-Austen, 1906, 95 ; Martens & Thiele, 1908, 261 ; Laidlaw, 1931, 191.

North Borneo (type locality, Labuan) ; Natuna Island (Smith, 1894).

Rather depressed pyramidal, sharply keeled, suture not impressed ; whorls about $7\frac{1}{2}$; aperture lunate ; lower surface more tumid than upper ; striae fine, becoming more marked on later whorls ; uniformly dull brown. Diam. max. 44mm., alt. 15mm. This description is based on a specimen in the Royal Scottish Museum labelled "metatype", determined by Pfeiffer. Dextral individuals are occasionally found. This species is near to *janus*, but has a more elevated spire.

Dyakia intradentata Godwin-Austen.

Dyakia intradentata Godwin-Austen, 1891, 30 ; 1906, 96 ; Gude, 1903, 57 ; Martens & Thiele, 1908, 261 ; Laidlaw, 1931, 191.

Syntypes (1891. 3. 17. 36-37) in the British Museum (Natural History). North Borneo (Niah Hills).

Conchologically identical with *D. hugonis*, but with a short row of scratch-like markings, visible externally, inside the lower part of the last whorl, about half a turn from the aperture, of doubtful significance. Two examples, one from Mount Molu, the other from the Niah Hills, have similar markings.

Dyakia janus (Beck)

Helix Janus bifrons Chemnitz, 1784, 307, pl. 213, figs. 3016, 3017.

Ariophanta janus Beck, 1837, 5.

Helix lindstedti Pfeiffer, 1856, 387 ; Tenison-Woods, 1888, 1024.

Ryssota ? *janus* Wallace, 1865, 407.

Nanina janus Martens, 1867, 226, pl. 11, fig. 4 ; Issel, 1874, 394 ; Tryon, 1886, 19, pl. 3, figs. 34, 36 ; Tenison-Woods, 1888, 1024.

Dyakia lindstedti Smith, 1895, 103, pl. 2, fig. 10; Schepman, 1896, 153; Gude, 1903, 49, 57, 60; Martens & Thiele, 1908, 261; Laidlaw, 1931, 191.

Dyakia janus Godwin-Austen, 1891, 31; 1906, 96; Gude, 1903, 49, 57, 60; Martens & Thiele, 1908, 261; Gude & Woodward, 1921, 185; Laidlaw, 1931, 191; Rensch, 1934a, 329; Paravicini, 1935a, 60.

North Borneo. I have discussed this species with Tomlin and Fulton and we agreed that the figure given by von Martens resembles the type specimen of *lindstedti* and that the locality Malacca given by Pfeiffer is due to an error in labelling.

Shell depressed, lenticular, sharply keeled, suture not impressed; whorls about $7\frac{1}{2}$. Dextral individuals are known to occur. Colour corneous or brownish yellow, chestnut in var. *castanea* Smith. A specimen of the latter in the Royal Scottish Museum measures diam. max. 38.8mm., alt. 18.5mm. Smith remarks that this species approaches *regalis* in form and sculpture; it is also near to *hugonis* and *densestriata*.

***Dyakia kintana* (de Morgan)**

Ariophanta kintana de Morgan, 1885, 381, pl. 6, fig. 2.

Dyakia kintana Gude, 1903, 50; Laidlaw, 1931, 191.

Malaya, North Perak.

"Abundant in the Peninsula. Lives amongst dead leaves in the forest and on vegetation near villages. Very near *janus* and *lindstedti*, distinguished by its more squat (eocrassée) shape" (de Morgan). Agrees with the figure of *amphidroma* var. *mackensiana* given by von Martens (1867, p. 11, fig. 5).

***Dyakia lahatensis* (de Morgan)**

Ariophanta lahatensis de Morgan, 1885, 382, pl. 6, fig. 4.

Dyakia lahatensis Gude, 1903, 50; Laidlaw, 1931, 191.

Perak.

Comparison of de Morgan's figures with specimens of *retrorsa* suggests that these two forms are at any rate closely related. De Morgan's figures seem to be from specimens not fully mature and his measurements (diam. max. 25mm., alt. 14mm.) support this conclusion. I find too from his figure that he has slightly under-estimated the height of his shell. He describes his specimens as translucent, horny, rather finely striate, with 4 to 5 whorls, strongly keeled, with the suture little impressed. Immature shells of *Dyakia* usually have a well marked peripheral keel, which becomes less evident in a number of the species towards the aperture, or it may disappear altogether.

***Dyakia marseveeni* (Bock)**

Helix (Nanina) marseveeni Bock, 1881, 629, pl. 55, fig. 2.

Nanina marseveeni Tryon, 1886, 19, pl. 3, fig. 32.

Nanina maarseveeni Martens, 1900, 8.

Nanina (*Dyakia*) *marseveeni* Kobelt, 1901, 1009, pl. 261, fig. 12.

Dyakia maarseveeni Gude, 1903, 52 ; Laidlaw, 1931, 191 ; Rensch, 1934a, 328.

Dyakia perstriata Sykes, 1905, 227, fig. 2 ; Degner, 1928, 356 ; Laidlaw, 1931, 191.

Ariophanta maarseveeni Bullen, 1906, 126.

Sumatra (type locality Sidjoendjoeng). Holotype (1881. 6. 6. 3) in the British Museum (Natural History). Synonymous with *martini* according to Rensch (1934). Syntypes of *perstriata* (1930. 9. 12. 59-60) are in the British Museum (Natural History).

Depressed pyramidal, sharply keeled to the aperture, which is well angled ; shell more tumid below than above ; suture scarcely impressed ; upper surface with fairly strong, regular striae ; under surface more weakly striated ; dull horn colour ; whorls $6\frac{1}{2}$. Dimensions : *maarseveeni*, diam. max. 32mm., alt. 21mm. ; *perstriata*, diam. max. 37mm., alt. 20mm. (specimens in the Royal Scottish Museum). *D. maarseveeni* is the Sumatran representative of the Malayan *D. mackensiana*, which Jutting (1959) unites with *maarseveeni*, citing as synonyms *Hemiplecta amphidroma* van Heurn & Paravicini (1922, 29), *Dyakia martini* Rensch (1934, 327), Adam & Leloup (1939, 22) and *D. janus* Paravicini (1935, 60). Four shells in the Royal Scottish Museum are all sinistral. There are also two specimens labelled in Fulton's writing "*Ariophanta* (*Dyakia*) *perstriata* Sykes. West Sumatra."

***Dyakia mackensiana* (Souleyet)**

Helix mackensiana Souleyet, 1841, 347 ; 1852, 504, pl. 28, figs. 27-29.

Nanina amphidroma var. *mackensiana* Martens, 1867, 221, pl. 11, fig. 5.

Dyakia amphidroma v. *mackensiana* Gude, 1903, 52, 53.

Dyakia martini Rensch, 1934, 329.

Malaya ; Billiton ; Bangka ; Gude gives also Pulau Laut.

The figure in von Martens is of a dextral shell from Sumatra. The Malayan form, so far as I know, is always sinistral, and the name *mackensiana* should be reserved for this peninsular form. I have seen examples from the area of Sungei Ujong and there are specimens in the British Museum (Natural History) labelled Malacca. The latter are small, diam. max. about 27mm., alt. 24mm. This is very near *kintana* and *sannio*, the latter being rather more globose with a less marked keel.

"The shells which Martens (1864, 1867) described as *Nanina amphidroma* are in my opinion a composite species, the dextral specimens falling under *Elaphroconcha martini* (Pfeiffer), the sinistral ones under *Dyakia mackensiana* (Souleyet)" (Jutting, 1959, 154).

Dyakia mindaiensis (Bock)

Helix mindaiensis Bock, 1881, 633, pl. 55, fig. 7.

Nanina mindaiensis Tryon, 1886, 19, pl. 2, fig. 29.

Nanina (Dyakia) mindaiensis Kobelt, 1901, 1010, pl. 261, fig. 13.

Dyakia mindaiensis Godwin-Austen, 1891, 32 ; 1906, 96 ; Schepman, 1896, 153 ; Gude, 1903, 57 ; Martens & Thiele, 1908, 261 ; Laidlaw, 1931, 191.

"*Nanina mendaiensis* Semper", Tenison-Woods, 1888, pl. 30, fig. 22.
Borneo (type from Mindai, Amontai district).

Allied to *densestriata*. Depressed pyramidal, upper surface very slightly convex ; suture not impressed ; the striae show a slight tendency to be bunched, as in *regalis* ; whorls 6⁺ ; colour reddish brown. A specimen in the Royal Scottish Museum measures diam. max. 28mm., alt. 18mm.

Dyakia regalis (Benson)

Helix regalis Benson, 1850, 215 ; Reeve, 1852, pl. 96, fig. 526 ; Pfeiffer, 1853a, 52.

Helix vittata Adams & Reeve, 1848, 60, pl. 15, fig. 7 a, b, c.

Ryssota regalis Wallace, 1865, 407.

Nanina regalis Martens, 1867, 225 ; Issel, 1874, 393 ; Tryon, 1886, 19, pl. 2, figs. 30, 31 ; Tenison-Woods, 1888, 1024.

Dyakia regalis Godwin-Austen, 1891, 31 ; 1906, 96 ; Gude, 1903, 54, 57 ; Martens & Thiele, 1908, 261 ; Laidlaw, 1931, 191 ; Jutting, 1950b, 426.

Dyakia subdebilis Smith, 1895, 104, pl. 2, fig. 11 ; Gude, 1903, 57 ; Martens & Thiele, 1908, 261 ; Laidlaw, 1931, 191.

Borneo : type locality Sarawak ; type locality of *vittata* Balam-bangan ; holotype (1889. 4. 27. 27) of *subdebilis* (Sarawak) in the British Museum (Natural History) ; erroneously recorded from Java (Leschke, 1914, 227).

Depressed pyramidal, lenticular, acutely keeled ; suture not impressed ; peristome not reflexed ; aperture oblique ; whorls 7 $\frac{1}{4}$; striae on dorsal surface numerous, slightly crinkled and tending to be bunched, especially on the third and fourth whorls, giving the shell a characteristic appearance, under surface smoother ; uniformly straw yellow or chestnut, usually with one or more spiral zones of dark purplish brown, which may alternate with pale yellow zones on the upper surface ; lower surface generally paler with a dark circum-umbilical zone, or the umbilical area may be whitish, with or without a narrow limiting zone of darker colour peripherally. Diam. max. 35mm., alt. 22mm. (largest specimen).

D. subdebilis was described from a single specimen, the dimensions of which (23 x 11mm.) coincide exactly with those of a specimen of *regalis* ; Smith's figure resembles immature *regalis*.

Dyakia retrorsa (Gould)

Helix (*Caracolla*) *retrorsa* Gould, 1844, 455, pl. 24, fig. 5.

Ariophanta retrorsa Godwin-Austen, 1883, part 3, 137, part 4, pl. 34, fig. 4.

Nanina (*Hemiplecta*) *retrorsa* Martens, 1887, 161.

Dyakia ? *retrorsa* Blanford & Godwin-Austen, 1908, 300, No. 470.

Dyakia retrorsa Gude, 1903, 50 ; Laidlaw, 1931, 191.

Lower Burma and probably southern Siam.

There are two unlocalized specimens in the Royal Scottish Museum, both of which show the same peculiar wrinkling of the shell surface. There are differences between the two specimens, but I think both are forms of the same species. Both are keeled, one rather feebly, whilst the other has a very definite carination : in this respect they differ from *D. salangana*.

Dyakia rumphii (Busch)

Helix rumphii von dem Busch, 1842, 9, pl. 4, fig. 2.

Nanina rumphii Mousson, 1849, 18, pl. 1, fig. 2 ; von Martens, 1867, 220 ; Tryon, 1886, 20, pl. 3, fig. 38 ; Smith, 1887a, 132 ; Tenison-Woods, 1888, 1024.

Ariophanta rumphii Semper, 1870, 54, pl. 3, fig. 18.

Hemiplecta rumphii Boettger, 1890, 140.

Dyakia rumphii von Martens, 1892, 229 ; Wiegmann, 1893, 146, pl. 11, figs. 4-7 ; Gude, 1903, 52, 54 ; Godwin-Austen, 1906, 95 ; Schepman, 1912, 231 ; Leschke, 1914, 228 ; Oostingh, 1923, 147 ; Degner, 1928, 356 ; Laidlaw, 1931, 191 ; Rensch, 1934b, 478 ; Paravicini, 1935a, 60, 1935b, 172 ; Jutting, 1950b, 422, fig. 39.

Java, mainly in the west, up to about 6000 feet ; southern Sumatra.

Shell depressed conical, base rounded, last whorl shouldered, the angle disappearing before the aperture ; whorls $5\frac{1}{2}$; suture feebly impressed ; aperture lunate, a little elongated ; earlier whorls almost smooth, the later ones with fine, rather variable striae which are wavy and have a beaded appearance when seen with a hand lens ; under surface smoother and more polished. Colour rather uniformly brown, a little paler at the periphery, which is marked with a narrow, darker zone fading gradually into the paler under surface. Jutting says that the colour may be straw, yellowish brown or greenish brown. All the twenty or so examples I have seen have a rather warm brown colour. Dimensions of a large shell, diam. max. 45.5mm., alt. 22mm. Mevr. van der Feen (van Benthem Jutting) informs me that she collected this species in ground litter, among dead leaves and decaying tree trunks. It is often eaten by monkeys. I have seen a single specimen from south Sumatra.

Dyakia salangana (Martens)

Nanina salangana von Martens, 1883, 134, pl. 25, figs. 8-12.

Hemiplecta salangana Collinge, 1903, 209.

Dyakia salangana Gude, 1903, 50 ; Laidlaw, 1931, 191.

South Siam ; Salanga (Junk Ceilon).

I am indebted to Dr. A. Zilch for photographs of a syntype in the Senckenberg Museum. Shell sinistral, depressed turbinate, without keel, suture moderately impressed ; whorls about $5\frac{1}{2}$; umbilicus perceptibly more open than in other species of *Dyakia*, and the surface striation, fine spiral wrinkling, is distinctive, but resembles that of *retrorsa*. Diam. max. 43mm., alt. 23mm. Var. *martensi* Collinge (1903) from north-east Malaya is larger (diam. max. 52mm.). There are six specimens of *salangana*, collected by Kerr, in the British Museum (Natural History), from various localities in Siam. The largest of these, from Kao Kuap Kra, is similar to the syntype. The other specimens are smaller and immature : they show some shouldering of the periphery in the earlier whorls and the umbilicus is less open. This species is related to *retrorsa* but lacks the keel.

***Dyakia sannio* (Pfeiffer)**

Helix sannio Pfeiffer, 1854, 57 ; Reeve, 1854, pl. 184, fig. 1271.

Nanina albersi Martens, 1864, 265 ; 1867, 224, pl. 11, fig. 3 ; Issel, 1874, 32 ; Tryon, 1886, 18, pl. 2, fig. 26.

Ryssota janus Wallace, 1865, 407.

Dyakia albersi Gude, 1903, 49.

Dyakia sannio Laidlaw, 1931, 191.

Malaya.

There are two specimens from the Salisbury collection, evidently from Fulton's material, in the Royal Scottish Museum, labelled *albersi*, subsequently altered by Fulton to *sannio*. They agree closely with the figure given by von Martens (1867). Diam. max. 37mm., alt. 26mm.; whorls 6. Rather depressed turbinate, not angulate or keeled at the aperture ; suture moderately impressed ; aperture lunate, peristome very slightly reflexed ; surface striate, the striae somewhat irregular and tending to be bunched into more prominent groups, not markedly beaded ; fawn colour, with a narrow slight darkening at the periphery. Fulton pointed out to me a long time ago that *albersi* is a synonym of *sannio*.

***Dyakia smithiana* (Gude)**

Dyakia smithiana Gude, 1903, 47, pl. 3, fig. 1a, b ; Degner, 1928, 356 ; Laidlaw, 1931, 191 ; Jutting, 1959, 155.

Ariophanta (*Dyakia*) *smithiana* Bullen, 1906, 126.

Holotype (1898. 12. 4. 5) in the British Museum (Natural History). Sumatra : Mount Sago, Selinjak.

Closely allied to *granaria* and *euconus*. Diam. max. 39mm., alt. 28mm. Turbinate, not keeled, aperture lunate ; rather coarsely striated ; suture moderately impressed ; umbilicus rather more occluded by the lower lip than in other species. Unlike most species of *Dyakia*, *smithiana* is quite brightly coloured : ground chalky white under a thin yellow periostracum, with spiral chocolate bands of

varying number and width ; interior of the aperture white, the brown bands visible from within. This description is based on specimens in the British Museum (Natural History).

Dyakia sumatrensis (Martens).

Nanina sumatrensis (Mousson MS.) von Martens, 1867, 237 ; Pfeiffer, 1870, 26, pl. 115, figs. 1, 2 ; Tryon, 1886, 18, pl. 2, fig. 25 ; Tenison-Woods, 1888, 1023, pl. 30, fig. 21 ; Kobelt, 1901, 992, pl. 257, figs. 4, 5.

Dyakia sumatrensis Gude, 1903, 52 ; Degner, 1928, 356.

Ariophanta sumatrana Rolle, 1908, 64.

Sumatra.

Von Martens describes this species as sinistral, similar to *Nanina rugata*, but with more convex whorls ; last whorl without a keel, with rugae parallel to the aperture and with spiral lines often interrupted by malleate markings. Diam. max. 51mm., alt. 35mm. Tenison-Woods gives a figure which is rather crude but shows regular costulation. *D. sumatrensis* has not been examined anatomically and its systematic position is doubtful.

Dyakia taivanica (Möllendorff)

Ariophanta taivanica Möllendorff, 1884, 173 ; 1885, 387, pl. 10, fig. 16.

Nanina (*Ariophanta*) *taivanica* Kobelt, 1900, 978, pl. 253, figs. 8, 9.

Type in the Senckenberg Museum (165006). Southern Formosa (Takao).

I am indebted to Dr. A. Zilch for the information that Möllendorff has labelled the holotype of this species as a *Dyakia*, and also for photographs of the holotype. Conchologically it is evidently a member of the genus, agreeing quite closely with *maarseveeni*. It is more depressed than this species, or even than *janus* ; whorls about 6 ; suture feebly impressed ; carinate ; more tumid below than above, especially near the aperture ; striation fairly regular. Diam. max. 31mm., alt. 15mm.

Dyakia weyersi (Smith).

Dyakia weyersi Smith, 1887, 24, pl. 9, figs. 8-10 ; Aldrich, 1898, 1 ; Gude, 1903, 52 ; Laidlaw, 1931, 191.

Nanina (*Dyakia*) *weyersi* Kobelt, 1901, 1008, pl. 261, figs. 2-4.

Syntypes (1887. 7. 29. 1-2) in the British Museum (Natural History). Sumatra, Badjo Island.

Pyramidal, rather depressed, periphery shouldered, the angle disappearing at the aperture ; suture not impressed ; aperture lunate, peristome very slightly reflexed ; upper surface regularly striate, smoother below ; whorls about 7 ; light horn-colour, slightly darker on the peripheral angle. Diam. max. 31mm., alt. 21mm. Description

based on a specimen labelled by Fulton in the Royal Scottish Museum. Closely allied to *mackensiana*. Var. *rotundata* Degner (1928, 356, fig. 1a-c), Mentawai Islands, the type of which is in the Zoological Museum, Amsterdam, differs in its rounded periphery, and perhaps in having a slightly more raised spire.

ACKNOWLEDGMENTS

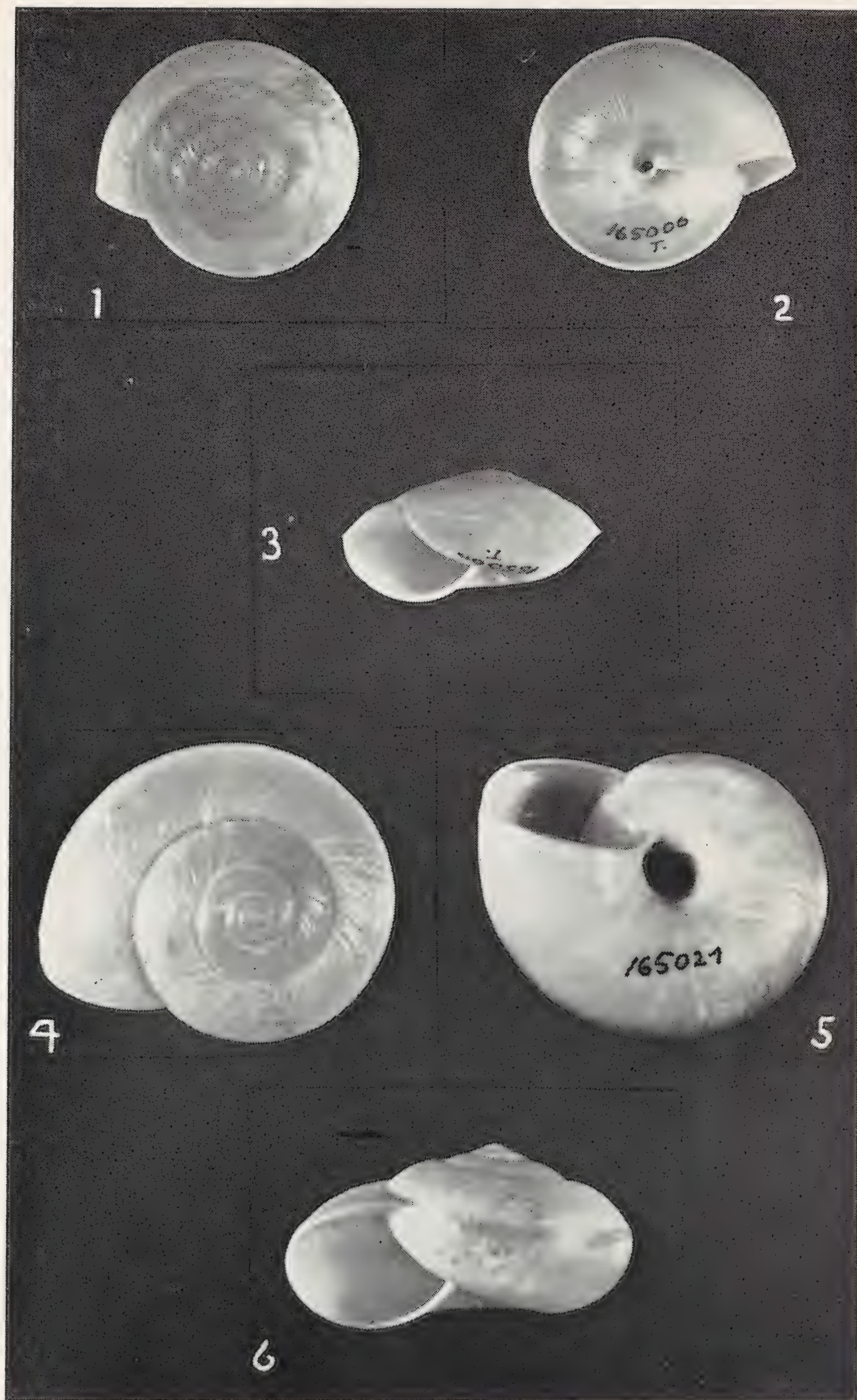
I am greatly indebted for assistance in preparing this paper to the Rev. H. E. J. Biggs, Mr. S. P. Dance, Mevr. W. S. S. van der Feen (van Benthem Jutting), Mr. J. F. Peake, and Mr. A. R. Waterston.

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To face page 150.

- 1-3. *Dyakia taivanica* (Möllendorff)
4-6. *Dyakia salangana* (von Martens)

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EXPLANATION OF PLATE 8.

Figures 1, 2, 3. *Dyakia taivanica* (Möllendorff), holotype, Senckenberg Museum.

Figures 4, 5, 6: *Dyakia salangana* (Martens), syntype, Senckenberg Museum. All figures natural size. Photographs by courtesy of Dr. A. Zilch.

***Oxychilus alliarius* (Miller) in pitchers of *Sarracenia*.—**

I am indebted to my colleague Mr. Alan Dodson for drawing my attention to two specimens of this snail which he found in the pitcher of an insectivorous plant, *Sarracenia purpurea* L. The plant came from the Liverpool Parks and Gardens establishment at Harthill. One snail still retained a portion of the soft parts in the shell, the other was merely the disintegrating remnant of a shell. G. H. Rodman (1928, *J. Conch.* **18**, 265) has recorded finding *Retinella radiatula* (Alder) in the pitchers of several kinds of *Nepenthes* at Kew, and suggests that they were attracted by the decomposing animal matter.

N. F. McMILLAN.

***PILA LETOURNEUXI* (BOURGUIGNAT), ITS SYNONYMY AND DISTRIBUTION**

By T. PAIN

(Read before the Society, 14 April 1962)

Much confusion has existed in the past concerning the true identity of *Pila letourneuxi*, mainly due to its never having been figured. Von Martens (1897, 157) confused it with *P. adusta* (Reeve), a species endemic to the island of Zanzibar, which he described as a new subspecies of the widely distributed *P. ovata* (Olivier), under the name *deckeni*. Sowerby (1910, 59) had examined Bourguignat's type specimen in the Paris Museum and recognised it as being a distinct species. He wrongly, however, gave Lake Victoria as the type locality.

In my notes on *P. ovata* (Pain, 1952, 286) I accepted a small series of shells from Uganda (Greeki River at Sebei) collected by Loveridge as representing *P. letourneuxi*, and since these are not separable from typical *ovata*, Bourguignat's species was included in the synonymy. This error was in consequence allowed to stand in my revision of the African species of the genus *Pila* (Pain, 1961), and I am deeply indebted to Dr. B. Verdcourt for drawing my attention to the fact that *P. letourneuxi* was not only omitted from my 1961 revision, but comes from an area far removed from the known range of *P. ovata*.

Through the kindness of Monsieur J. Gaillard, I have received a photograph of Bourguignat's type specimen, which is stated to be from the Kingani River near Bagamoyo, Tanganyika Territory. The only other species of *Pila* known from this region is *P. gradata* (Smith, 1881, 289). This was stated to be from Lake Nyasa and between it and the coast to the east (Thomson). Recent researches carried out by Mr. D. Eccles have established beyond all reasonable doubt that no *Pila* s.s. occur in the lake, and it follows therefore that Thomson must have obtained the type set of *P. gradata* between the lake and the Indian Ocean in the same general area as that known to be inhabited by *P. letourneuxi*.

Through the kind offices of Mr. J. C. Shiff of the Malaria and Bilharzia Research Laboratory in Salisbury, Southern Rhodesia, I have received for study specimens of *Pila* collected at Bagamoyo, and although all are immature, they are certainly identical with *gradata*. The holotype of this species, beautifully figured by Smith (1881), is a fully grown shell of noticeably gradated appearance, as the scientific name implies, and a paratype from the G. B. Sowerby III collection, and now in my possession, differs only in being slightly larger. Bourguignat's type of *letourneuxi* is, however, somewhat immature, nevertheless it forms a link between the series of very young shells from Bagamoyo and adult examples such as the type set of *gradata*. Alderson (1925) figures a very fine fully grown shell as well as a

slightly immature specimen closely resembling the type of *letourneuxi*. Unfortunately the locality whence these shells came is not known.

Neither Smith nor Alderson connected *gradata* with *letourneuxi*, presumably because it had never been figured and was unknown to them. Study of the type, however, leaves me in no doubt that Bourguignat's species was founded upon an immature example of what was later described by Smith as *gradata*. Since Bourguignat's name has priority the species must be known as *Pila letourneuxi*.

Both Germain (1923, 125) and Leloup (1953, 60) confused *gradata* with *P. ovata gordonii* (Smith) from Lake Victoria and neither make any reference to *letourneuxi*. These authors give excellent figures of *P. ovata gordonii*, wrongly referring these to *gradata*. Alderson (1925, 88) has clearly pointed out the differences between this species and *P. ovata* (Olivier) and *P. wernei* (Philippi), neither of which, although widely distributed throughout tropical Africa, occurs in the region inhabited by *P. letourneuxi*.

Mozley (1939, 700) collected *Pila* at a number of localities in Tanganyika Territory; in his published account of these, he referred all to *P. gradata* (Smith), but confused this with the endemic species from the island of Zanzibar, which he had also collected, namely *P. adusta* (Reeve), giving an excellent figure of the latter under the name *gradata*. Unfortunately I have been unable to trace the present location of Mozley's specimens.

In view of the fact that *P. letourneuxi* has remained virtually unknown, and the synonymous *P. gradata* has been frequently confused with other species, a detailed synonymy is set out below.

***Pila letourneuxi* (Bourguignat)**

Ampullaria letourneuxi Bourguignat, 1879. *Descript. Moll. Egypt*, 29.

„ *gradata* Smith, 1881. *Proc. Zool. Soc. Lond.*, 289, pl. 33, figs. 22, 22a.

„ „ Billotte, 1885. *Bull. Soc. malac. France*, 2, 109.

„ „ Bourguignat, 1889. *Moll. terr. et fluv. Afr. Equator*, 167, 169.

„ „ Smith, 1890. *Ann. & Mag. Nat. Hist.* (6), **6**, no. 32 : 148, no. 20.

„ *letourneuxi* von Martens, 1897. *Besch. Weichth. Deutsch-Ost-Afr.* 157-158.

„ „ Sowerby, 1910. *Proc. Malac. Soc. Lond.* **9** : 59, nos. 128 & 131.

Pachylabra gradata Kobelt, 1911. *Mon. Ampullariidae*, in Martini & Chemnitz *Syst. Conch. Cab.*, n.f., 48, pl. 31, fig. 2 (exclusive of much of the synonymy).

Ampullaria gradata Alderson, 1925. *Studies in Ampullaria*, 88, pl. 18, figs. 3, 4.

From the confusion which has resulted from attempts by various authors in the past to identify both *letourneuxi* and *gradata*, it will be appreciated that the identification of all the East African species of *Pila* is one of considerable difficulty. E. A. Smith (1881, 289), who had spent a lifetime studying them, wrote of *P. wernei* (Philippi) and *P. ovata* (Olivier), the two commonest species, "These are very closely related and it is a matter of impossibility to define the limiting character of either of them. The present species (*gradata*) also may be only another form of the same shell". Alderson (1925, 188), however, considered *wernei* to be distinct from *ovata*, but thought *gradata* might be perhaps intermediate between them. He quotes Smith as saying that his species "may be distinguished by its broader and shorter aperture and the considerably greater arcuation of the columella: or the form may be described as more pyriform, being narrower above and broader below". Alderson also draws attention to the shape of the lower part of the aperture, which in *gradata* is more evenly rounded than in *wernei*, and the projection of the lip at the periphery is less strongly marked, so that the slope of the outline between these points is more gradual and rounded, and the whole shell has a less peaked appearance. He also points out that Smith does not mention a distinction that is very obvious if large specimens of *wernei* be brought to the comparison, namely that in this species the lip is produced downwards to a considerable extent, whereas in *gradata* the lower end of the aperture seems hardly to break away from the outline of the body-whorl. Furthermore, the internal bands in *gradata*, especially those in the lower part of the aperture, often extend to the outer edge, in *wernei* the lip is not traversed.

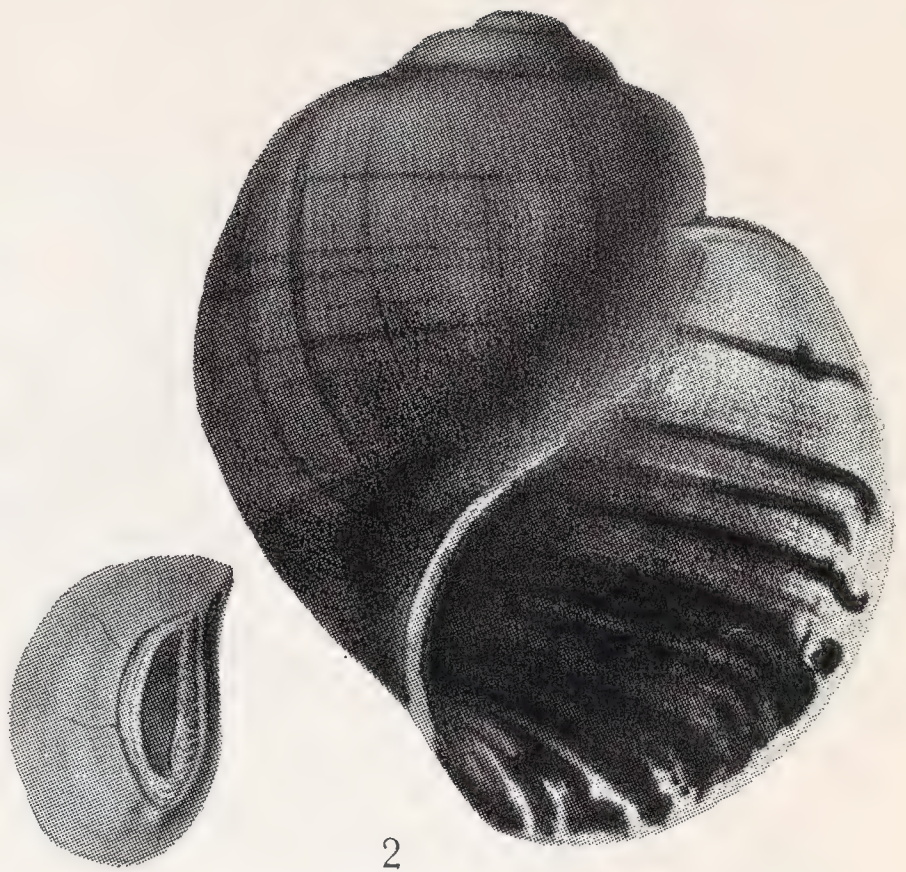
It may also be pointed out regarding the operculum, that in *wernei* this appendage fits tightly into the lip, in *gradata* it is drawn some distance into the aperture. The type of *letourneuxi* is in the Paris Museum, that of *gradata* in the British Museum (Natural History).

DISTRIBUTION. Authentic records of *P. letourneuxi* are all from southern Kenya and Tanganyika Territory. Kenya: Sabaki River, Malindi (washed into the sea by floods: Harries, 1961); Voi River (McArthur). Tanganyika Territory: Kingani River near Bagamoyo (type, Bourguignat); Mkomazi, Tanga Railway, Hungila; pond three miles south of Bagamoyo and one mile east of the Dar es Salaam-Bagamoyo road; stream seven miles south of Bagamoyo; Muhala River at Malongwe (all Mozley, 1939); Usagara District (Billotte); Pangani River (Conradt, 1891); Morogoro (Lieder, 1893); Ugogo, between Unyangwira and Mbiwe (Stuhlmann, 1890); Ubugwe (Neumann, 1893).

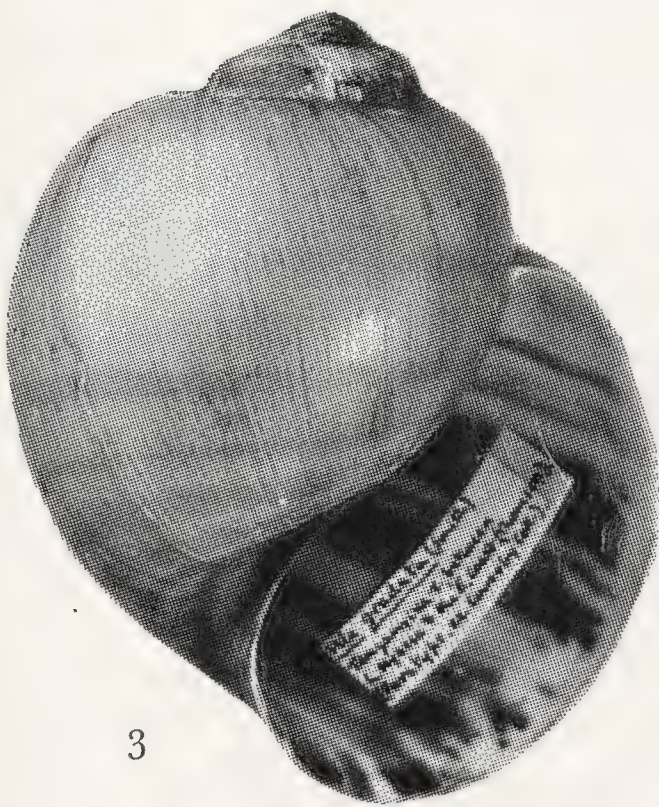
As will be seen from the above, the number of reliable locality records for *P. letourneuxi* is not large, and will certainly be greatly increased when systematic collecting is undertaken in its area of distribution. As at present known, this would appear to be confined



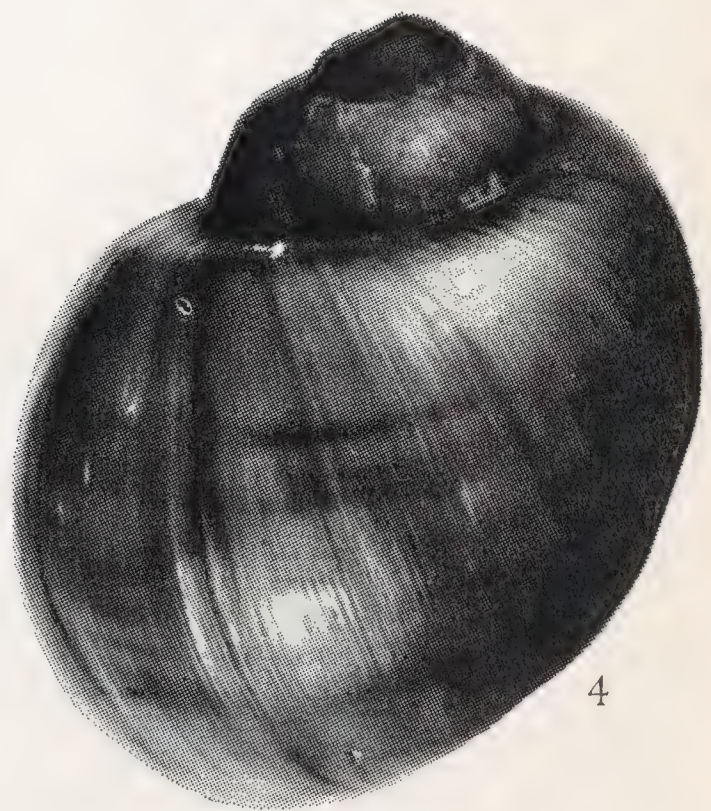
1



2



3



4

1. *Pila letourneuxi* (Bourguignat)
2-4. *Pila gradata* (Smith)

To face page 154.

to rivers flowing into the Indian Ocean, extending from the Sabaki River in the north, to about 15° lat. south, although there are no records at present either for Nyasaland or Mozambique, probably due to lack of collectors.

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EXPLANATION OF PLATE 9.

- Figure 1. *Ampullaria letourneuxi* Bourguignat, holotype. Size 39.5 x 35.5 mm. Photograph by J. Gaillard.
- Figure 2. *Ampullaria gradata* Smith, holotype, from Smith, 1881, plate 33, figs. 22, 22a. Actual size of original figure of shell, 73 x 67 mm. Photograph by R. F. Cumberland.
- Figures 3 and 4. *Ampullaria gradata* Smith, paratype, G. B. Sowerby III collection. Size 82 x 72 mm. Photographs by R. F. Cumberland.

A SPECIMEN OF *CONUS GLORIAMARIS* CHEMNITZ IN GLASGOW UNIVERSITY

By S. P. DANCE and F. R. WOODWARD

(Read before the Society, 20 October 1962)

The "Glory of the Sea", *Conus gloriamaris* Chemnitz, which is certainly the best known and the most coveted of all marine shells, has been the subject of numerous accounts in scientific and non-scientific journals. Usually these accounts have recorded the discovery of specimens that have lain unrecognised in museum collections and elsewhere although, recently, a freshly collected specimen was recorded from the island of Corregidor, Manila Bay, Philippine Islands, having been found there in October 1957 (Jutting, 1958). On three occasions there have been attempts to list every known specimen (Melvill, 1887; Moros, 1927; Jutting, 1949). Twenty-two specimens are listed tentatively by Jutting (1949) and one or two papers have appeared since providing additional information on known specimens and recording the existence of others (Ankel, 1951; García San Nicolas, 1951; Jutting, 1958; Coomans, 1960). Furthermore, for some years one of us (S.P.D.) has been accumulating fresh data, as yet unpublished,

which, it is hoped, will make a new, revised list acceptable. The present note records the discovery of a specimen in the Department of Zoology, University of Glasgow, which, it is suggested, has a connection with the Quaker, Dr. John Fothergill, and with the surgeon, Dr. William Hunter.

The specimen was found (by F.R.W.) during an inspection of the large shell collection belonging to the zoology section of the Hunterian Museum, now housed in the Department of Zoology, University of Glasgow. It was in a cardboard tray without a label, but in a corner of the drawer containing the shell a label was found on which was written "Conus gloria maris Chemn. Eastern Seas". This label, which is written on the reverse side of a piece of paper cut from the University calendar for the year 1885, bears a similar handwriting to that on some other labels in the collection which, in addition, carry the date 1891. It is assumed that they were written by a student or a technician under the supervision of Professor John Young, who was Regius Professor of Natural History at that time. There can be little doubt that any original labels would have been discarded. The shell collection is indexed on cards, one of which reads "Conus gloria maris, Eastern seas". Since the card has no information to the contrary it is inferred that it pertains to a specimen that once formed part of the original collection of Dr. William Hunter (1718-1783), the famous surgeon, and chief physician to Queen Charlotte. This collection, known as the Hunterian Museum, was bequeathed to the University of Glasgow and, after a temporary sojourn in London, it was installed in Glasgow in 1807. In a descriptive account of the Hunterian Museum, published shortly afterwards, the following passage is found, "[Conus] — Gloria Maris, Glory of the Sea, native place unknown, but is presumed to be either Japan, New Guinea, or some less frequented country, very rare" (Laskey, 1813, 103). This, however, is a verbatim copy of a passage in the *Museum Calonnianum* (Humphrey, 1797, 16). It would seem then that a specimen of *gloriamaris* was present in the collection when it reached Glasgow and that the present specimen is not a later addition.

William Hunter was a close friend of the eminent Quaker and man of science, Dr. John Fothergill (1712-1780), whose shell collection came to be, next to that of the Duchess of Portland, the best in England (Fox, 1919, 212). Undoubtedly the Fothergill collection contained many rarities and, although proof is lacking, it is most likely that it included a *gloriamaris*. Fothergill's shells and corals were offered, after his death, to Hunter, who bought them for a sum £500 less than the valuation, variously stated to be £1200 or £1500 (Fox, 1919, pp. 212-3).

Despite its possible illustrious history the shell is of inferior quality for, in addition to two naturally repaired fractures on the body whorl, the spire is much worn and both the base and the upper portion of the outer lip have been filed down. The whole shell appears to have been well rubbed to give it a smooth surface and a high gloss. In



Conus gloriamaris Chemnitz

To face page 156.

the eighteenth century, notably in Holland, shells were frequently filed and polished in this way to "improve" their appearance (Jutting, 1939, 221). The coloration is faded but the pattern is well defined. Length: 80 mm., width: 30 mm. This is the seventh specimen known to exist in British collections; there are five in the British Museum (Natural History), and one in the National Museum of Wales, Cardiff. From available evidence it may be the twenty-fifth specimen known to exist in collections throughout the world.

ACKNOWLEDGMENTS

We are indebted to Professor C. M. Yonge, F.R.S., for granting permission to inspect the collections in his charge and for permission to reproduce the photographs. Dr. G. Owen kindly provided information on William Hunter.

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EXPLANATION OF PLATE 10

Conus gloriamaris Chemnitz, specimen in the Hunterian Museum, Department of Zoology, Glasgow University. Length: 80 mm, width: 30 mm. (Photographs reproduced by permission of the Department of Zoology, Glasgow University).

FURTHER NOTES ON *AFROPUNCTUM* HAAS

By B. VERDCOURT

(Read before the Society, 20 October 1962)

Since I wrote a brief note concerning the genus *Afropunctum* Haas (Verdcourt, 1959) several other facts about it have come to light. Adam (1960) has mentioned it in his list of species referred to the genus *Thapsia* Albers, in which he expresses the opinion that *Thapsiella connollyi* Preston is really *Afropunctum zanguebaricum* (Craven). I have examined the relevant types in the British Museum (Natural History) and agree that *Helix zanguebarica* Craven, a species curiously overlooked by von Martens and other workers, is conspecific with *Afropunctum mermodi* Haas. I also agree that the types of *Thapsiella connollyi* are mature adults of the species, which is clearly characterised by the way in which the transverse sculpture of the upper surface spreads over the peripheral area and a little way on to the base of the shell, but there stops. The species is, accordingly, widespread in tropical Africa; the known localities are indicated on the accompanying map. With the permission of Mr. B. W. Sparks, I am also correcting a determination given in Sparks and Grove (1961): the fossil shells from Tibesti referred to *Thapsia vesti* (Jickeli) are without doubt *Afropunctum zanguebaricum* (Craven), an interesting record which fully fits in with the fact that Tibesti had a wetter climate in Quaternary times. I am grateful to Mr. Sparks for sending me some juvenile specimens for examination.

The synonymy of this species is therefore as follows:

Afropunctum zanguebaricum (Craven): Adam, 1960, *J. Conchyl.* **100**: 76.

Helix zanguebarica Craven, 1880, *Proc. Zool. Soc. Lond.* **1880**: 217, pl. 22, figs. 4 a, b, c.

Thapsiella connollyi Preston, 1912, *Ann. Mag. Nat. Hist.* **9**: 70, fig. 3.

?*Sitala kigomaensis* Germain, 1919, *Bull. Mus. Hist. nat. Paris* **1919**: 351, figs. 32, 33.

Afropunctum mermodi Haas, 1934, *Zool. Anz.* **107**: 221, fig. 1. Verdcourt, 1959, *Basteria* **23**: 91.

Kaliella connollyi (Preston): Connolly, 1939, *Ann. S. Afr. Mus.* **33**: 165.

Thapsia vesti sensu: Sparks & Grove, 1961, *J. Linn. Soc. Lond. (Zool.)* **44**: 359, pl. 2, figs. k-m.

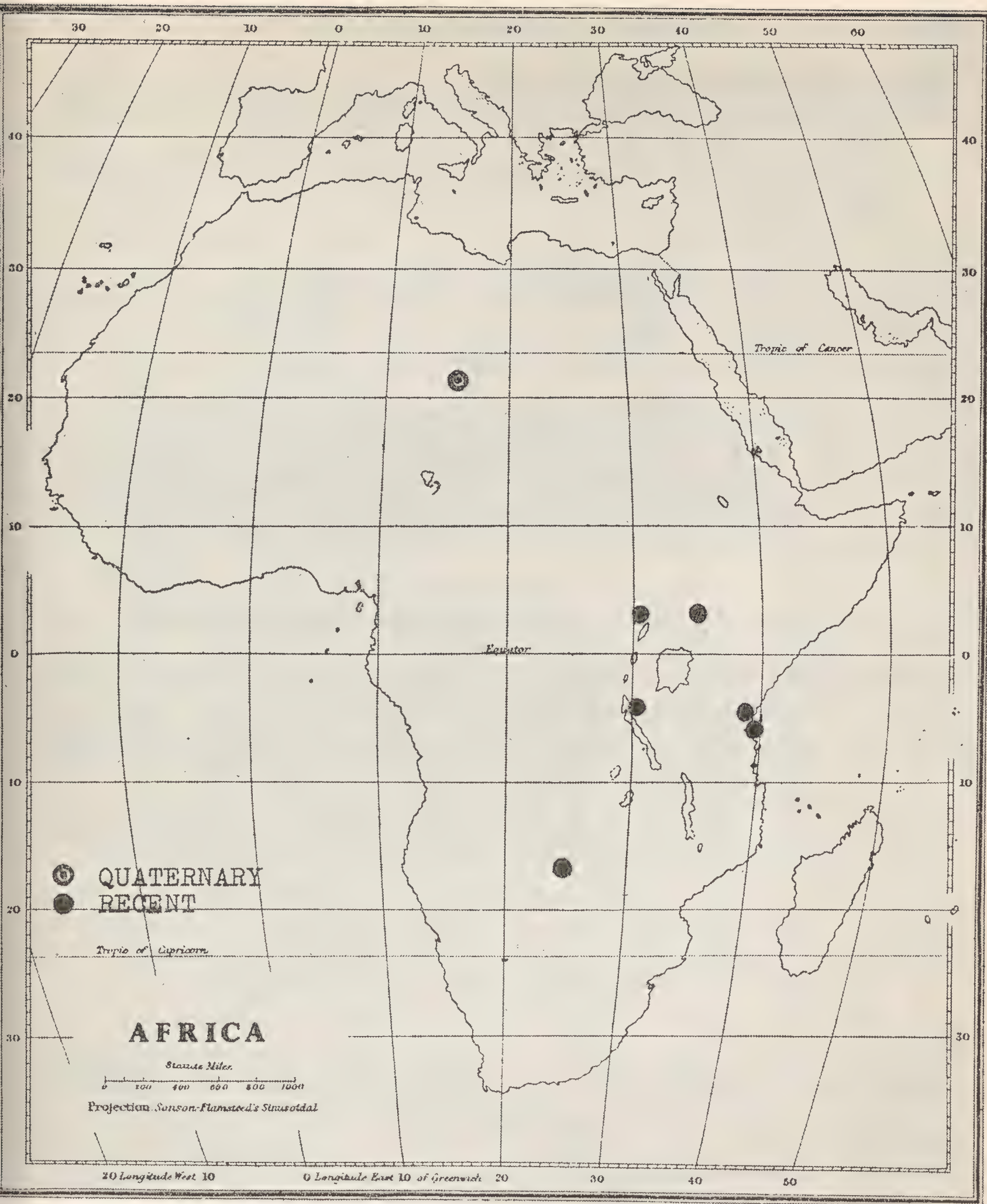
DISTRIBUTION

SAHARA: Tibesti: Begour Crater (Quaternary), A. T. Grove.

UGANDA: West Nile: Rhino Camp, W. Wilkinson.

KENYA: Turkana: Turkwell River drift, C. F. Hemming.

TANGANYIKA: East Usambara foothills: Magila, A. E. Craven; Western Province: Kigoma.



Distribution of *Afropunctum zanguebaricum*

ZANZIBAR : Zanzibar, Gibbons.

SOUTHERN RHODESIA : Victoria Falls, M. Connolly.

Unfortunately no living examples have yet been preserved, so the correct family placing of this snail is not certain, although its allocation to Endodontidae may well be correct. Connolly (1939) described a further species from Southern Rhodesia as *Afropunctum quadrisculptum*. I have examined the exceedingly poor immature shell which is the type specimen : it is certainly not congeneric with *A. zanguebaricum* (Craven), but is in fact the striate relative of *Guppya rum-rutiensis* (Preston) mentioned in my paper (Verdcourt, 1960, 109), for which a name is now available :

***Guppya quadrisculpta* (Connolly).**

Afropunctum quadrisculptum Connolly, 1939, *Ann. S. Afr. Mus.* **33** : 249, pl. 7, figs. 15-17.

Guppya rumrutiensis (Preston) var. : Verdcourt, 1960, *J. Conchyl.* **100** : 109.

DISTRIBUTION

KENYA : Nyanza : Chebukwali Dam, J. McMahon; Thika; Mabuloni Rocks, P. R. O. Bally.

SOUTHERN RHODESIA : Mrewa, Blackie.

I may also state here that my surmise that the lot used by Preston as the basis of his *Thapsia conuloidea* was not uniform has proved to be correct. The paratypes in the British Museum (Natural History) are not conspecific with the holotype preserved at Tervuren, but are examples of *Guppya rumrutiensis* (Preston) (Verdcourt, 1960, 110).

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DIETARY EXTENSION IN SOME SPECIES OF MARINE MOLLUSCA

By STELLA M. TURK

(Read before the Society, 15 December 1962)

A small collection of Mollusca taken from crab-pots points to an interesting extension of diet in Trochidae. The specimens were taken from under the bottom boards of crabber boats, where they had accumulated after the crab-pots had been hauled in. The crabbers had been working in depths from 18 to 25 fathoms at three separate stations between Mount's Bay and the Runnelstone, Cornwall (Census Area 18, British Marine Area, 1961). As the species present and the numbers of each would seem to be of some significance, a complete list of those taken is given. Most of the shells had remains of soft

parts still in them, varying from a fairly good state of preservation to advanced decay. In the following list an asterisk indicates completely empty shells.

Calliostoma zizyphinum (L.): 44.

Gibbula tumida (Montagu): 1 + 2*.

G. cineraria (L.): 3.

Cantharidus clelandi (Wood), var. *pyramidata* Jeffreys: 10 + 1*.

Tricolia pullus (L.): 1*.

Cingula semicostata (Montagu): 1*.

Aporrhais pespelicani (L.): 1*.

Natica poliana Chiaje: 16* (mostly tenanted by hermit-crabs).

Trivia arctica (Montagu): 26.

Trophon muricatus (Montagu): 1*.

Nassarius reticulatus (L.): 13.

N. incrassatus (Ström): 350 approx.

Actaeon tornatilis (L.): 1*.

Chlamys opercularis (L.): 7 juvenile.

Of this total of 477 individuals about 360 (75 per cent.) were *Nassarius*, which are typically scavenging Mollusca likely to be attracted by crab bait, but there seems to be some evidence that the Trochidae also are necrophilous when opportunity occurs. Jeffreys (1865, 325) writes of *Cantharidus exasperatus* (Pennant), "At Lulworth this little *Trochus* enters the lobster-pots along with *T. cinerarius* var. *conica*, *Buccinum undatum*, *Nassa reticulata*, *N. incrassata* and *Murex erinaceus*—all of them apparently being attracted by the bait, which consists of soft crab and pieces of fish. It is therefore highly probable that the *Trochi* are sarcophagous." A specimen of *Calliostoma zizyphinum* kept in a small aquarium for a year has been observed at different times feeding on fragments of beef fed to fish, and it has been seen eating the decomposing body of a sea-anemone, although there were available small Algae and algal detritus, which Fretter and Graham (1962, 261) give as the main food of Trochidae. As *Trivia arctica* was found in samples from all three stations, it may well be that they are also attracted by decaying animal matter, though this seems unlikely in animals said to feed exclusively on compound Tunicates. Such varied food habits are not unknown amongst Mollusca, as is shown by land slugs (Arionidae and Limacidae), and no doubt it contributes largely to their evolutionary success, if success can be assessed by ability to maintain large numbers of individuals in varied habitats.

The other species listed are probably chance introductions brought up on pieces of weed or pebbles, or swimming within the upward sweep of the crab-pots, as in the case of *Chlamys opercularis* and *Actaeon tornatilis*. More evidence of the habits of some of these species might well be obtained from such sources as those discussed here, and interesting comparisons could be made between the numbers of species and specimens so taken on different parts of the British coast.

My thanks are tendered to Mr. G. H. Buchanan-Wollaston, Fishery Officer for Cornwall, not only for suggesting this rich source of certain kinds of Mollusca, but also for obtaining them for me.

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HELIX NEMORALIS L. AT HIGH ALTITUDES IN THE BRITISH ISLES

By N. F. McMILLAN

(Read before the Society, 20 October 1962)

According to Taylor (1910, 279) *Helix nemoralis* L. ascends to about 4000 feet in the Pyrenees and the Maritime Alps, but in the British Isles the species seems less adventurous. Its occurrence at 3000 feet on Snowdon is accordingly of much interest and I am grateful to Mr. George W. Temperley for allowing me to make use of the following note:

"In June 1933, while on a botanical field meeting with the Alpine Gardens Society, I made four ascents of Snowdon by its north face. On one of these ascents I was surprised to find, at an altitude of at least 3000 ft., a number of living specimens of *Helix nemoralis*. I collected a few of them as a record of the occurrence. They are included in the collection of Mollusca which I sent you a short time ago. See label attached to the specimens."

A single specimen labelled "Snowdon, at 3000 ft. G.W.T. June 1933" is in the Temperley collection which was presented to Liverpool Public Museums in 1957. The shell is pink, bandless, with a dark lip, and measures 17.5mm. in height and 22mm. in width.

This Snowdon shell closely resembles the "large race of *nemoralis*, very like that which occurs on some of the Sligo mountains" which Stelfox (1945) found living between 1800 and 2000 feet on the Galtee Mountains, Co. Tipperary (the specimens are now in Liverpool Museums). In fact there is a strong resemblance between the Galtee shells, the large race from Annacoona on the upland limestone plateau of the Dartry Mountains, Co. Sligo (Comfort, 1944) and the Snowdon specimen. All the shells are large, pink and bandless; some have a dark lip, some a pale one, while some, especially the Annacoona shells, are more high spired.

Elsewhere in the British Isles *H. nemoralis* has been found at about 2000 feet in the neighbourhood of Ben Lawers, Perthshire (Stelfox, 1952), and Blezard (1955) took it at 1600 feet on Crossfell, Cumberland, where it was fairly numerous on a limestone scar. At these high altitudes the geological formation does not seem to matter: the Snowdon locality is igneous, the Lawers area mainly micaschist, the Galtees are Old Red Sandstone and at Annacoona *H. nemoralis* lives on outcrops of Carboniferous Limestone isolated in a sea of peat.

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FULGORARIA BLAIZEI BARNARD

By K. H. BARNARD (South African Museum)

(Read before the Society, 20 October 1962)

This species was described in 1959 (*Ann. S. Afr. Mus.* **45**: 28, fig. 8b) from a living specimen 39mm. long, and three dead shells 42, 24 and 18mm. long. The size of the protoconch, about 3mm., indicated that these specimens were juveniles. Recently I have seen two much larger shells in the collection of Mrs. H. Boswell of Pretoria, which are indubitably adults of this species. Both are dead shells but fresh. One with protoconch and 6 whorls measures 93 x 33mm., the other with whorls 2 to 6 measures 96 x 35mm. The latter, even with the apex missing, is the larger shell. Such variability in size with the same number of whorls, and also variability in size of the protoconch, is found also, for instance, in *Neptuneopsis gilchristi*. In both shells the spiral lirae are more distinct than in the juveniles, extending to the 4th whorl in the 96mm. shell and to the 6th whorl in the 93mm. shell. The rostrum and anterior part of the base are crenulate, due to the lirae crossing the lines of growth. The upper part of the outer lip is slightly hollowed, thickened and flared outwards, a feature which seems to indicate maturity: it is seen in other species of *Fulgoraria* (e.g. Kuroda, 1950, *Illustr. Cat. Jap. Shells*, No. 5, pl. 5, figs. 5, 9-11).

The juveniles were taken on the southern slope of the Agulhas Bank in 105 fathoms. The large shells come from off the Tugela River (Natal-Zululand) in 160-180 fathoms. When the deeper waters of the Continental slope are more thoroughly investigated, the present gap in the distribution of the species will probably be filled. Mrs. Boswell tells me she has now another specimen 114mm. long.

ON THE OCCURRENCE OF *CYPRAEA MICRODON* GRAY IN EAST AFRICA

By M. J. H. LIVERSIDGE

(Read before the Society, 20 October 1962)

Cypraea microdon Gray was first identified in the fresh state from East Africa by Dr. B. Verdcourt; previously it had been mistaken for *Cypraea fimbriata* Gmelin, which it somewhat resembles. I described (1962) two specimens found on the East African coast in January, 1961. At the time only three shells were known to me, but since then I have managed to trace several more.

The shell of *C. microdon* is ovoid, resembling in shape that of *C. fimbriata*, measuring between about 9mm. and 15mm. in length, and about 5mm. wide. The dorsum is a pale buff colour, vaguely banded by three obscure, transverse bands. The whole is freckled by numerous tiny darker brown spots, the largest of which are towards the centre of the dorsum. The extremities are blotched on each side with brownish purple spots, visible on both the dorsum and the base. Both the columella and the labial teeth are extremely small, and a lens is needed to examine them properly. There are usually in the region of 26 labial and over 30 columellar teeth in a specimen measuring 10mm. long, whilst shells of *C. fimbriata* of a similar size have approximately 15 teeth on each side of the aperture. The base is white. The animal of *C. microdon* is very similar to that of *C. fimbriata*: in each case the mantle is scarlet.

Cypraea microdon chrysalis Kiener is the subspecies which occurs in East Africa, and with which this paper is concerned; it was originally described from Mauritius.

Prof. Dr. F. A. Schilder, whilst never having recorded *C. microdon* from East Africa, has furnished me with information on the occurrence of the species from other localities along the east coast of Africa, which I quote below:

“Aden: I have examined personally a shell 85.55 (length, the first figure, in tenths of a millimetre; breadth as a percentage of the length); it has been mentioned in *Bull. Soc. Zool. France* 56: 212, 1931, as *C. microdon*; it was undoubtedly *C. microdon*, and came from a collection sent to me by Dr. Schlesch (Denmark).

Aden: I have examined a shell 93.56, collected by Shopland, now in the British Museum (Nat. Hist.); it is undoubtedly *C. microdon*, though the posterior extremity is relatively short. But I have learned that Shopland's shells collected at Aden have been mixed accidentally with some from elsewhere.

Jibuti: Vayssi re, *Bull. Mus. Hist. nat.* 1905: 168, mentions *C. chrysalis* and *C. microdon* from Jibuti, collected by Jousseau; one could suggest that his *C. chrysalis* may be the real *microdon*, and his *C. microdon* may be *C. fimbriata*, but one could also suggest that Jousseau called the same species *C. fimbriata* in different years

C. chrysalis and *C. microdon*. . . . The occurrence of *C. microdon* in Jibuti remains doubtful.

Mombasa : L. R. Cox, 1930. *Monogr. Geol. Dept. Hunterian Mus. Glasgow* 4 : 141, pl. 13, fig. 13. A fossil shell.

Farther off, *C. microdon* has been collected at the Glorieuses Is. (by Bureau), at Diego Suarez in Madagascar (by Decary), and frequently in Mauritius. . . ."

From this letter I am able to conclude that *C. microdon* occurs in the southern end of the Red Sea, and extends considerably further south to Madagascar. The Jibuti record appears rather dubious, but is quite feasible.

Dr. L. R. Cox, F.R.S., who published the record from Mombasa, writes : "The record of a fossil specimen of *C. microdon* from East Africa was published by me in 1930 in *Monographs of the Geological Department of the Hunterian Museum, Glasgow University*, No. IV—"Reports on Geological Collections from the Coastlands of Kenya Colony made by Miss M. McKinnon Wood." The reference to the record of *Erronea microdon* is on p. 141, pl. XIII, fig. 13. The specimen, a single one, came from a post-Pliocene raised reef S.E. of Mombasa Island, a quarter of a mile N. of Ras Serani, and was collected by Miss McKinnon Wood. It is deposited in the Hunterian Museum, Glasgow."

Cypraea microdon was first recorded alive in East Africa in August 1960, when Mrs. C. D. Knight, of Zanzibar, queried Dr. Verdcourt's identification of a specimen she had found as *C. fimbriata*. On further examination this proved to be *C. microdon*; the shell is now in the collection of the Coryndon Memorial Museum, Nairobi. In addition Mrs. Knight has found two more specimens. All three shells were found in the coral *Galaxea clavus*, at below datum tides, in 3 to 4 feet of water. *Galaxea clavus* grows in banks, 2 to 3 feet long, with each piece separate and easy to pull away from the adjoining ones. The specimens collected by Mrs. Knight were found on the pieces fairly low down, on the underside of the coral. I have only the measurements of one of the specimens, they being 120.50 (length in tenths of mm., width as percentage of length).

Until January 1961 only two shells (both collected by Mrs. Knight) were known to me. In that month, however, two specimens were taken alive at Diani Beach, by my father (Liversidge, 1962).

When I delivered my paper to the Conchological Society I was informed by Mr. Scase that he was expecting a pair of specimens from Zanzibar, where they were collected by Mr. Fainzilber. I got in touch with the latter, whom I found was able to supply a great deal of information on *C. microdon* in East Africa. At the date of writing (February, 1962) he had collected six specimens of *C. microdon*, all from Zanzibar. All were found in *Galaxea clavus* coral, at depths of between 6 and 10 feet; three are from Chukwani, 6 miles from Zanzibar town, whilst the other three come from the "First" Sand Bank, about 3 miles from the town.

Mr. Fainzilber was also able to give me information on shells in the collections of other East African collectors. In addition to Mrs. Knight's three specimens, he lists *C. microdon* in the collections of Mrs. Cameron (two), Mrs. Dalton (three) and Mrs. Jinx (two). All except those of Mrs. Cameron were from Chukwani and in *Galaxea clavus*; Mrs. Cameron's shells were from the Sand Bank, in the same type of coral.

Of the Zanzibar specimens I have the measurements of one of Mrs. Knight's and four of Mr. Fainzilber's. The latter's shells are distributed between the collections of Mr. Scase, whose shells measure 100.60 and 90.56, Mr. Fainzilber, whose are 119.53 and 119.48, and Mr. Ray Summers in the U.S.A.

On the mainland Mr. Fainzilber had the record of only three *C. microdon* found by Messrs. Walshe and Boggis at Dar es Salaam, Tanganyika.

Mr. E. T. Haywood was able to confirm that Mrs. Dalton had collected three specimens of *C. microdon*, as he has one of them in his own private collection. He has sent me the length of his shell, and also told me that he thought the shells were collected by Mrs. Dalton in 1958; his one is 120mm. in length.

In conclusion it will be observed that of the 21 specimens I have managed to trace, only five are from the mainland. These, however, are sufficiently far apart in locality to show that the species probably enjoys an extensive range along the whole East African coast, at least south of Mombasa. Of the shells of which I have the measurements, it would appear that the Zanzibar shells are larger than the *C. microdon* from the mainland; the exceptions are Mr. Scase's specimens, which measure about the same as the two shells in my collection. It certainly seems that this species is less uncommon in Zanzibar than it is on the mainland, but it is obvious that as a whole *C. microdon* is not at all as rare in East Africa as has generally been believed.

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A COLLECTION OF CYPRAEA FROM DIANI, KENYA.

By M. J. H. LIVERSIDGE

(Read before the Society, 17 March 1962)

Diani Beach is situated some twenty miles south of Mombasa on the coast of Kenya. Here there is a fine coral reef, which can easily be reached at low spring tides. The reef, which extends the whole length of the East African coast, provides an excellent hunting ground

for cowries. The shells upon which this paper is based were collected between December 1959 and April 1961. All the specimens mentioned, with few exceptions, are in my own collection. This paper makes no claim to be a check-list of Diani *Cypraea*, though I believe it to be fairly complete. None of the species is restricted to this area. I should like here to record my gratitude to Dr. B. Verdcourt for the help he has given me in identifying and recording several specimens.

There are two coral reefs at Diani Beach : the Outer Reef, referred to above, which lies about three quarters of a mile from the shore, and an Inner Reef, which is dead and supports very few cowries. I have found few shells here, except *Cypraea moneta* and *C. annulus*, which are so abundant that they can be found almost anywhere. Much of the Inner Reef has become silted up, which would account for the scarcity of cowries. The Outer Reef, on the other hand, supports a great many different species of Mollusca. Here the coral is alive and the reef is less frequently exposed at low tide, and is prevented from silting up by the continuous movement of the Indian Ocean. Altogether 34 species of *Cypraea* are listed below, out of a total of 50 recorded from East Africa.

C. globulus brevirostris (Schilder & Schilder) : two specimens, both rather worn, 11 and 15.5 mm. long; rare.

C. kieneri kieneri Hidalgo : six specimens all taken alive, from 14 to 19 mm. in length; one shell, collected in April 1961, is juvenile; fairly common.

C. stolidia diauges Melvill : a single specimen, very beach-rolled, 19 mm. long (the normal size is 25 to 30 mm.); very rare.

C. microdon chrysalis Kiener : two specimens, both found alive in January 1961 (see page 122); lengths 10 and 9 mm. This species is very rare in East Africa, but this may be due to lack of information, since it has only recently been recorded.

C. punctata punctata L. : one shell, empty but in excellent condition, not quite mature, 18 mm. long; the colour is brighter than usual, being orange instead of the usual cream; it is also larger than the other East African examples I have seen; rather uncommon.

C. fimbriata durbanensis (Schilder & Schilder) : five specimens, all taken alive, 11.5 to 14 mm. in length; one has a conspicuous brown blotch in the centre of the dorsum; fairly common.

C. felina felina Gmelin : two specimens, both rather worn, 20 mm. long; rare.

C. staphylaea laevigata (Dautzenberg) : three shells, two of which were alive and the third is in good condition; 13 to 16.5 mm. in length; uncommon.

C. limacina interstincta Wood : two specimens, both taken alive, 16 and 22 mm. in length; uncommon. I have also in my collection a specimen which appears to be a hybrid between *C. staphylaea* L. and *C. limacina* Lamarck. This shell, 21 mm. in length, was found alive;

the markings take the form of large, widely spaced pustules; the base is white with teeth typical of *limacina*, except for those on the columella, which are slightly longer.

C. isabella isabella L.: I have collected many living examples of this subspecies, as it is very common. The range in length is considerable, being from 12.5 to 29.5 mm. Five are juvenile specimens, four of which were found in April 1961.

C. poraria poraria L.: a single shell, 14 mm. long, taken dead; rather rare.

C. gangranosa reentsii Dunker: one empty shell, 12.5 mm. long. This is the only specimen which I know from East Africa.

C. erosa erosa L.: three specimens, two 39 and one 38 mm. long; fairly common. There is another specimen which may be *C. nebrites* (Melvill), or possibly a small *erosa*; it is 23 mm. in length.

C. marginalis marginalis Dillwyn: one dead shell, in quite good condition, 26 mm. in length. This subspecies has never, so far as I know, been collected alive in East Africa, although I am informed by Mr. R. S. Benton that his wife has found ssp. *pseudocellata* (Schilder & Schilder) alive at Shanzu in Kenya. This constitutes a new East African record.

C. caput-serpentis caput-serpentis L.: one dead shell has been given me labelled "from the Diani area." As I know very little about this shell, I am inclined to doubt the locality. The shell is 23 mm. long.

C. helvola argella (Melvill): several shells, all found alive, from 14 to 25 mm. in length; very common.

C. annulus camelorum Rochebrune: extremely abundant; I have many specimens from 15 to 21 mm. in length.

C. moneta L.: very common; the shells from Diani are mostly smaller than typical East African specimens.

C. teres alveolus Tapperone: two living specimens and one very worn shell, 27 to 39 mm. in length; uncommon.

C. chinensis violacea Rous: two living examples, 29 and 27 mm. in length; the smaller one is juvenile, found in January 1961; the other is of exceptionally rich coloration; rather common.

C. cribraria comma Perry: four specimens, all living, 16 to 22 mm. long. There appear to be two varieties of this shell in East Africa: one with plain white margins and base, the other with small, pale wine-coloured spots on the margins.

C. caurica L.: three shells, 36 to 43 mm. in length. There are two varieties of this species, one having a white base and the other a flesh-coloured base; my specimens, which represent both varieties, are rather larger than most East African examples, which are normally 25 to 35 mm. in length; common.

C. lynx lynx L.: I have taken many specimens of this subspecies, which is abundant in the area, alive; usual length 29.5 to 43 mm.

C. vitellus dama Perry: many shells, all taken alive, 27 to 47 mm. in length. There are two varieties, the more common with a pale

base, whilst the other has a pinkish brown tinted base.

C. carneola sowerbyi Anton: many shells, the species being extremely common, all taken alive; length 24 to 53 mm.

C. scurra scurra Gmelin: I have only a very worn shell, 27 mm. in length, which could have been washed along the coast from another place; I have, however, seen a living specimen from Diani; very rare.

C. histrio Gmelin: six examples, all either taken alive or in excellent condition, 52 to 62 mm. long; one shell, taken alive in April 1961, is juvenile.

C. argus contrastriata Perry: one specimen in extremely poor condition, 72 mm. in length. This shell is one of the most sought after by collectors in East Africa.

C. talpa imperialis (Schilder & Schilder): a single specimen, found dead but in fine condition; it is small for the species, 54 mm. in length; rare.

C. arabica immanis (Schilder & Schilder): two shells, both taken alive, 68 and 85 mm. in length, the latter being the only good specimen I have ever seen from the Inner Reef at Diani; uncommon.

C. testudinaria ingens (Schilder & Schilder): one shell, dead but in fair condition; 106 mm. in length.

C. tigris tigris L.: several specimens, all collected alive; 83 to 95 mm. in length; two juveniles were found on the Inner Reef in August 1961; very common.

REVIEWS

A synopsis of the British freshwater Bivalve Molluscs.

A. E. ELLIS, M.A., F.L.S. Pp. 92, 38 text-figures, 16 plates (73 figures). *Synopses of the British Fauna*, No. 13. Linnean Society of London, Burlington House, Piccadilly, London, W.1. 1962. 20s. net.

In this new *Synopsis*, our Honorary Editor has revised his two previous *Synopses* of 1946 and 1947, as well as his paper on the British species of *Pisidium* published in the *Proceedings of the Malacological Society of London* in 1940. These are now out of print, and the last has long been virtually unobtainable. The classification is based on that of Thiele, 1934. There are a few name changes and some rearrangement, the results of more recent research. In addition to the descriptions of the shells, the distributional and ecological information has been brought up to date. The synonymy of the species is given, together with their geological and geographical range. There are keys to all the groups and a complete index. Most of the text-figures, drawn with great care and accuracy by the author, and the excellent photographs, the work of his father, the Rev. R. A. Ellis (now in his 90th year), have been reproduced again from the originals, and are completely adequate for identification.

This work fills a long-felt want, both for the beginner and the specialist. The former will find the notes on collecting, preparing and preserving the shells to be of the greatest use. This is the only publication devoted exclusively to the British freshwater Bivalves, and is a "must" for all those interested in them.

L. W. STRATTON.

[The Rev. Robert Arthur Ellis died suddenly on 18 October 1962.]

British Mesozoic Fossils. pp. v, 205, 73 plates. British Museum (Natural History), London, August 1962. 12s. 6d.

This is the second of three illustrated handbooks designed to enable the inexperienced to know what fossils they may expect to find, and to identify for themselves those they have collected. It follows the same pattern as the first book on British Caenozoic Fossils (reviewed by Dennis Curry in this *Journal*) and again the preparation has largely been by a former president of the Society, Mr. C. P. Castell. There are two important improvements—(i) the stratigraphical list of fossils includes the plate and figure number of each species, and (ii) there is a useful introductory essay by Dr. L. R. Cox, F.R.S., on Mesozoic stratigraphy, angled on where the fossils can be found.

365 fossils, mostly molluscs, are figured in 72 plates of line drawings, and these do provide a good idea of the British Mesozoic fauna and flora. It is mentioned in the preface that this number is a very small proportion of the thousands recorded, but it would also help the beginner if he was warned that the more obvious distinguishing features which he will notice are the generic characteristics. He (or she) should not be allowed to get the impression that every *Hoplites* is *H. dentatus*, or think a Corallian limestone is Cornbrash because he identifies his common *Nucleolites scutatus* as *N. clunicularis*. For the bivalves this impression is avoided by illustrating more than one species of 20 of the genera. That this is hardly done at all with the ammonites is partly a reflection of ammonite systematics, which could be eased by mentioning the family to which each species belongs. Even so there could be a slight improvement in the choice of ammonites, which include *Tulites subcontractus* and *Hyphantoceras reussianum*, but not a single turrilitid or baculitid.

Nearly all the names have been brought up to date with a sensible restraint in the use of generic splits, but the authors are mistaken in applying the rules of zoological nomenclature to stratigraphical, particularly formational, divisions; the *Trigonia clavellata* Beds may be called the Clavellata Beds but they should not be named the *Myophorella clavellata* Beds. It is to be hoped that the Palaeozoic volume will not introduce *Lingulella* Flags; if this is done, consistent practice will demand that the Permian be called the Molotovian!

As with the first volume the trustees of the British Museum are to be congratulated on producing a long-wanted handbook which so well fulfils its aim, for which there is no substitute, and yet at so cheap a price.

MICHAEL HANCOCK.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

798th (Special General) Meeting, held at the British Museum (Natural History), 20 October 1962

The President, Mr. L. W. Stratton, in the chair.

Revision of the Rules

The purpose of the Meeting was to consider and vote upon the Revision of the Society's rules, as drafted by the Council in April 1962, and circulated to members on 1 September 1962. Rules 2 and 22 were further emended in accordance with recent legislation as required by the Charity Commissioners. After discussion a vote was taken and the revised Rules were adopted by the requisite majority.

799th Meeting, held at the British Museum (Natural History), 20 October 1962

The President, Mr. L. W. Stratton, in the chair.

Communications

"A specimen of *Conus gloriamaris* Chemnitz in the University of Glasgow," by S. P. Dance and F. R. Woodward.

"Notes on the genus *Dyakia* Godwin-Austen, with a list of the species," by F. F. Laidlaw.

"On the occurrence of *Cypræa microdon* Gray in East Africa," by M. J. H. Liversidge.

"*Helix nemoralis* L. at high altitudes in the British Isles," by N. F. McMillan.

"*Oxychilus alliarius* (Miller) in pitchers of *Sarracenia*," by N. F. McMillan.

"*Fulgoraria blaizeii* Barnard," by K. H. Barnard.

"Some further remarks on the genus *Afropunctum* Haas," by B. Verdcourt.

Exhibits

Special exhibit: Snails of deserts, introduced by the Rev. H. E. J. Biggs.

The President: Australian freshwater mussels.

Mr. C. P. Castell: Holocene freshwater shells from the Rub' al Khali Desert.

Mr. S. P. Dance: two shells of *Conus gloriamaris* and relevant literature.

Mr. R. Fresco-Corbu: *Coquillages Marins* by J. Arrecgros (Lausanne, 1958).

Mr. J. F. Peake: specimens of *Dyakia* and sinistral *Ariophanta* from the collections of the British Museum.

Mr. T. Pain: operculate land snails from deserts.

Mr. L. C. Prebble: marine Gastropoda from New Zealand.

Mr. R. P. Scase : *Calliostoma monile* Reeve, Broome, W. Australia; a new giant form of *Cypraea gracilis japonica* Schilder (length 27.7mm.), Yokosuka (240 feet depth), Japan; three rare *Conus* : *C. drangai* Schwengel, Vernado Beach, Panama; *C. scalaris* Valenciennes, Guaymas, Mexico; *C. rufimaculosus* MacPherson, Tweeds Head, New South Wales (120 feet).

LECTURE

Dr. R. Tucker Abbott delivered a lecture to the Society, entitled "Oceanographic surveys for marine Mollusca in the Indo-Pacific," at the British Museum (Natural History) on 6 October, 1962.

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Conchological Society of Great Britain and Ireland

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AN ECOLOGICAL STUDY

BY L. W. STRATTON

(Part of Presidential Address, delivered 16 February 1963)

The study of the Mollusca may take many forms, all interrelated and all of importance. Molluscan morphology and taxonomy are very properly the province of the professional biologist, and the erudite papers produced on these subjects may prove discouraging to the amateur, who is often anxious to do something more than collect shells. There is one aspect of the study, however, in which the amateur may come into his own and that is molluscan ecology.

The father of molluscan ecology was the late Professor A. E. Boycott, whose papers on the land and freshwater Mollusca of the British Isles (1934 and 1936) will ever remain classics in their particular field. These great works were based on studies of the parish of Aldenham, in which he lived, and on presidential addresses he gave before the Hertfordshire Natural History Society, a body of amateur naturalists. He and Charles Oldham, who was for ten years Secretary of that Society, and for twenty-two years Treasurer of the Conchological Society, were both amateurs in the best sense of the word. It is true that Boycott had a scientific training, in that he was a pathologist of some eminence. He was introduced to ecology by his friend and neighbour, Professor (now Sir) Edward Salisbury, and it is probably true to say that he knew very little about ecology when he began its study. His papers were the results of careful observation and recording and a logical interpretation of the facts.

While few can hope to achieve the stature of Boycott, he would have been the first to agree that his work was incomplete, as all scientific work must be incomplete, each new discovery leading to another. There is, therefore, much to be done in the ecological field, and every contribution, however small, is of value.

The following is the record of a very simple exercise in ecology, designed to show the sort of thing that can be done by the veriest beginner. The molluscan world is but a small part of a much larger one, and molluscs must be studied in relation to the flora and fauna of that larger world, while the soils on which that larger world is based also play an important part. An endeavour has been made to show something of these relationships, and it is hoped that this study will encourage more people to venture into the realms of ecology, which are both stimulating and rewarding.

The counties of Bedfordshire, Hertfordshire and Buckinghamshire meet at a point some three-quarters of a mile south of the village of Dagnall. A mile to the north of this point is Whipsnade Zoo in Bedfordshire; a little more to the south is Ashridge Park, with the Bonar Law College, in Hertfordshire; and two miles to the west are the Ivinghoe Hills in Buckinghamshire. These hills may be described as a bastion of the Chiltern Hills as they stand out from the main chalk mass, with lower ground on three sides.

There is an isolated mass of chalk consisting of Beacon Hill, 750 feet, with a long spur to the east known as Gallows Hill, and two knolls, each over 700 feet, to the south of Beacon Hill. Between the two knolls is a deep gully; the more northerly knoll is joined to Beacon Hill by a saddle. The road from Ringshall in the south winds round the western side of Beacon Hill, dropping quickly to the Tring-Dunstable road, which runs from east to west along the foot of the escarpment and follows the ancient Icknield Way, the oldest road in Britain. South of the Beacon Hill mass and the road is Steps Hill, which rises gently to over 800 feet at its highest point. All is National Trust property and typical chalk country. To the north of the escarpment is a narrow band of the Upper Greensand, beyond which the great Oolitic plain stretches away to the Lias in the far distance. On the summit of Beacon Hill is a flat pear-shaped area, the site of a prehistoric camp, with a tumulus within. Beside the old stands the new, the stone block of a trigonometrical station. There is another tumulus on the southernmost knoll.

Apart from the Camp site, several well-worn paths and the gully, the whole area is clothed with long grass. Steps Hill is dotted with small hawthorns (*Crataegus monogyna*) and wayfaring trees (*Viburnum lantana*). There are many fine plants of *Arctium lappa* and *Taraxacum officinale*. On the southern side of the Beacon Hill mass are widely scattered dwarf hawthorns. On the northern escarpment there is a fairly close hawthorn scrub with much larger trees along the top of the slope, becoming more scattered and with smaller trees lower down. In spring the whole area is dotted with cowslips (*Primula veris*). By June there are masses of *Helianthemum chamaecistus*, and in August the dominant plant, apart from the grasses, is *Centaurea scabiosa*. There are patches of *Hippocrepis comosa*, *Ononis repens*, *Campanula rotundifolia* and an occasional *Carlina vulgaris*. Plants which appear to be confined to the southern side are *Anacamptis pyramidalis*, *Scabiosa columbaria* and the rare and beautiful *Gentianella germanica*. *Thymus pugelioides* (?) grows amongst the short grass of the gully. Over all flits the dainty chalk-hill blue butterfly. A particularly interesting area, though a small one, is situated by the road just before it turns westward between Steps Hill and the main mass. Here is a roughly circular patch of herbage about 25 feet across, consisting of *Heracleum sphondylium* growing to six feet in height, with *Artemisia vulgaris* and *Urtica dioica* up to four or five feet. The two last occur nowhere else in the area, and the first has but a few scattered plants just outside this patch.

While the snail population of the Ivinghoe Hills is very large, the number of species found during the summer and autumn of 1962 was no more than twelve, and one of these was represented only by dead shells. Four species, *Helix* (*Cepaea*) *nemoralis* L., *Hygromia* (*Trichia*) *liberta* (Westerlund), *Monacha cantiana* (Montagu) and *Helicella itala* (L.), occurred in vast numbers. *Abida secale* (Draparnaud) was common and in some places abundant. *Pupilla muscorum* (L.) and *Ceciloides acicula* (Müller) were widespread but needed looking for. *Oxychilus cellarius* (Müller) and *Retinella* (*Aegopinella*) *nitidula* (Draparnaud) had

a scattered and sparse distribution, and that of *Helicella* (*Cernuella*) *virgata* (da Costa) was most interesting. *Helicella* (*Candidula*) *caperata* (Montagu) yielded only two specimens. *Pomatias elegans* (Müller), dead and very old, three shells only, was found in a mole heap. It seems probable that this species has long been extinct on the Hills, though it has been found living on lower ground to the west. It prefers broken chalk in which to burrow. The thick mat of grass roots would make this difficult and would also break up the chalk into finer particles. It may even be that these shells are relics of the days when the Chilterns were covered with forest.

The most abundant snail was *Monacha cantiana*, which was ubiquitous. It was found everywhere in great numbers, except on the Camp site, which seemed to be devoid of snails. There was little variation in size, though the finest were found in the hogweed patch.

The three species of *Helicella*, all typical of chalk country, provided an interesting contrast. *H. itala* was almost as abundant as *M. cantiana* on the southern slopes of the Beacon Hill mass, was much scarcer on the northern side, and was not found at all across the road on Steps Hill. Like all the *Helicella*, it reaches maturity in the autumn, when large shells were plentiful. There was some variation in the width of the bands and var. *lutescens* was as common as the banded form.

The case of *H. virgata* gives rise to some speculation. It is a species most frequently associated with the short downland turf, but at Ivinghoe, as in so many places, this short turf is no more, due to the disappearance of the rabbit. Around the hogweed patch, where some years ago it was fairly common, only four specimens were found in the course of several visits. Of these, one was var. *albicans*, white with a single peripheral band, the other three being var. *albida*, pure white. Further to the north seven specimens were taken over a much wider area. Of these, four were typically banded shells, the others being var. *albida*. On the northern slopes *H. virgata* lived in only one place, a wide track ascending to the top of the escarpment, with the turf kept short by the passage of many feet. Here it lived in some numbers. A random sample of some 70 shells was taken, of which only six could be said to be typically banded. Fifteen were var. *lutescens*, some with a reddish colour round the aperture, 24 were var. *albida* and nine var. *albicans*. The rest had a single band, white above and coloured as *lutescens* below, a striking form. There were no snails in the long grass beside the track. It would seem that, owing to changing conditions, *H. virgata* is a waning species in the Ivinghoe Hills. The only two specimens of *H. caperata* were found at the hogweed patch, one typical in the middle, the other, var. *ornata*, in the long grass outside.

Helix nemoralis was abundant on Steps Hill and all the Beacon Hill slopes except in the hawthorn scrub, where it was decidedly scarce. Four large random samples, each of over 100 shells, were recorded during the autumn of 1962, three from various parts of the southern slopes and one from the northern. In all 22 band variations were found,

this not including shells of indeterminate banding, and there were two self-colours. There were quite remarkable differences between the shells of the southern and northern sides. On Steps Hill 68% were pink, 32% yellow; in the hogweed patch there were 95% pink and 5% yellow, and on the southern slopes of Beacon Hill the proportions were about the same as on Steps Hill. Of the northern sample only 44% were pink and 56% yellow. Over 40% of the southern shells were banded 12345, of the northern only 18.5%. The proportion of shells with bands fused or bands absent varied little, but of the shells having bands both fused and absent the figures for the south side were 2.2%, 8% and 4.4%, but on the north 25%. Again, on the south side 95% of all shells had brown lips and ribs; on the north only 24.3%, the rest being made up of brown and pink, brown and white, all pink and pink and white.

The finest shells, both in size and colour, were found at the hogweed patch, where 38% showed some fusion of the bands, the highest figure. One shell began as 12345, but after a repair on the body whorl, became (123)(45). Five plain pinks were found here, but only two in the rest of the area. As is often the case with this species, there was considerable variation in shape, from depressed to high-spined shells, but there was little variation in size amongst the southern shells. On the northern side there were considerable differences both in shape and size. Quite a large number of shells were small and high-spined, reminding one of var. *alpicola* of *Arianta arbustorum*. Two plain olive-brown shells, var. *olivacea*, were found on the south side.

There appears to be some question as to whether *Hygromia liberta* is a good species. Dr. H. E. Quick says there is no difference between its anatomy and that of *H. hispida*. However, another worker has recorded *H. liberta* from Ivinghoe, so that name will be used for the present. The shells were small, high-spined, densely hispid and with very narrow umbilicus; they occurred everywhere abundantly at the roots of grass. *Abida secale* lived with *H. liberta* in varying numbers, but the place for this species was the gully. On the north side, facing south, is short grass with little bare patches of chalk overhung with wild thyme. Under the thyme it was common to find up to eight or nine of these snails in a few square inches. On the south side, facing north, there is less thyme, and *A. secale* was less common than on the other side. It was also decidedly scarce on the northern slopes of Beacon and Gallows Hills. It has not so far been found on Steps Hill.

Ceciloides acicula was found on ant hills, as is commonly the case. Only dead shells were found, many of them quite fresh. This snail probably occurs with some frequency, but being subterranean in habit is not always easy to find. The untenanted parts of the ant hills proved too damp to delve into; the tenanted parts were occupied by very vicious red ants. The soil thrown up by moles seems to be too coarse to expose the shells, or it may be that the more violent mole action breaks them up. At any rate, none was found on mole

hills. *C. acicula* was also found on small bare patches of fine soil, possibly the denuded remains of ant hills. *Pupilla muscorum* was found in grass round these patches, and in damp weather, crawling about on the patches themselves. Both species occurred right up to the edge of the Camp site at the top of Beacon Hill. *Oxychilus cellarius* and *Retinella nitidula* were found in ones and twos all over the area at the roots of grass, but numbers were small.

Mention has been made of the association of *Abida secale* with wild thyme, and there were in the area several other obvious associations of snails with certain plants. In dry weather the best place to look for *H. nemoralis* on Steps Hill was under dandelion leaves, obviously because they gave good cover and, being fleshy, always kept fairly moist. The green leaves were never eaten, though the dead brown leaves underneath showed signs of attack. Elsewhere the greater knapweed provided the cover, with thick bushy plants a foot or more high. Later in the year when the leaves had died off *H. nemoralis* had moved away, but *T. cantiana* and *H. itala* could be seen clinging to the bare stems. Presumably a certain amount of decay had set in on the dead stems and food was thereby provided. *T. cantiana* fell off at the least touch, but *H. itala* clung much more tenaciously. In the hogweed patch *H. nemoralis* was found under the leaf canopy in summer. By October the hogweed had lost all its leaves, though the mugwort and nettles retained theirs a little longer. On the gaunt hogweed stems *H. nemoralis* sat out in the sunshine for all to see, many of the snails five feet from the ground. Very few were to be found on the mugwort and nettles. Again food was probably the deciding factor.

Apart from *Abida secale*, the gully has another claim on our interest, for in 1959 many specimens of the Sciomyzid fly *Ditaenia cineraella* (Fallén) were captured there. This may seem irrelevant in a paper mainly about snails, but the Sciomyzidae is a family of dipterous flies which are predatory or parasitic on snails. The larvae of these flies, generally referred to as marsh flies, feed on snails, some species eating only one snail and pupating within the shell, others eating a number of snails and pupating elsewhere. Being mainly inhabitants of marshes, the commonest hosts are freshwater pulmonates and members of the Succineidae, but some species will eat land snails.

In 1959 and again in 1960 Professor C. O. Berg, an entomologist from Cornell University, came to Rothamsted Experimental Station, Harpenden, as part of European tours in search of these flies. His first field trip in 1959 was with the author to Ivinghoe, and the first flies he took in Britain were *Ditaenia cinerella* in the gully. He was greatly surprised to find them in such a situation. Later he took them in Belgium, France, Austria and Italy, all in marshy places, and he quotes C. H. W. Pugh, 1957, as finding them in marshy places in Shropshire and North Wales. In 1960 Professor Berg took adult flies on sand dunes at Tenby, South Wales. P. Ardo, 1957, reports taking them on sand dunes at Orre, near Stavanger, Norway, so this fly does not seem to be particular about its habitat as long as snails are available.

Many dead snail shells were broken open both at Ivinghoe and Tenby in the hope of finding puparia, but none was found. The reason for this became obvious later. A number of living flies was sent by air-mail to Cornell. They not only survived the journey but laid eggs on the way, and from these flies were reared. The larvae proved catholic in their taste for snails, attacking American snails as avidly as they had British ones. Throughout the breeding experiments at Cornell they were fed exclusively on freshwater pulmonates, whereas their progenitors at Ivinghoe could only have fed on land snails. They are not, therefore, as many Sciomyzid flies are, host specific, i.e. confined to one species of snail. The host snails at Ivinghoe were not determined, though *Hygromia liberta* seems the most likely, with possibly *Helicella itala* and *Monacha cantiana*.

Ditaenia cinerella is also of historic interest. In 1917 H. Schitz reported rearing an adult fly from a puparium found in a snail shell. This was the first suggestion ever made that there was any connection between the Sciomyzidae and snails. Lundbeck, however, wrote in 1923, "I have the same species from flood debris. It is certainly no snail feeder, its presence in the shell being quite occasional." Professor Berg writes, "This must go down as one of the most obvious cases of faulty logic in the annals of biology. As if it followed automatically that every larva that kills a snail must pupate inside the shell. *D. cinerella* usually does not, as we found in rearing it."

It is of interest that Professor Berg found another Sciomyzid fly, *Sciomyza albocostata* Fallén, at Long Wood in 1959 and at Aldbury Common in 1960. These woods are only a few miles from Ivinghoe. These flies were reared on *Discus rotundatus*. The author is greatly indebted to Professor Berg for so willingly providing all this information.

Apart from the gentian and the flies, there is nothing remarkable about the flora and fauna of the Ivinghoe Hills. This study is in itself incomplete, as the list of molluscs probably is. Undoubtedly even a small extension of the area would reveal further species.

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A TENTATIVE LIST OF THE KNOWN SPECIMENS OF *CYPRAEA (EROSARIA) GUTTATA* GMELIN

By F. R. WOODWARD

(Read before the Society, 16 March 1963)

The combination of elegant beauty and great rarity has caused the cowry *Cypraea (Erosaria) guttata* Gmelin, 1791, to be greatly prized by conchologists for the past two hundred years. In consequence of its rarity, specimens may have passed through the hands of many collectors, thus making it difficult to trace the history of any one shell, besides creating confusion as to the precise number of specimens in existence. The first record of this cowry is that of Martini, 1769 (*Conchylien Cabinet*, I, figs. 252, 253), under the title *Argus flavus tenuis ocellis lacteis*. During the past eighteen months I have had the opportunity of examining the known specimens of this species in British collections, and have traced the whereabouts of further specimens in collections abroad. I have endeavoured in the following notes to give as complete an account as possible of these specimens. Some shells the present whereabouts of which cannot now be traced are omitted, e.g. the three referred to in *Conchologia Iconica*, which have been missing since 1845, the pear-shaped specimen which Schilder states is in California, and the specimen believed to have been collected from Manus Island during World War 2, which may be Mr. Amiot's specimen.

SPECIMEN 1

Tomlin collection, National Museum of Wales, Cardiff. This specimen was formerly in the possession of Hugh Owen, but whence he obtained it is unknown. On the dispersal of his collection it passed to the dealer, R. Damon of Weymouth, from whom it was purchased by J. Cosmo Melvill on 27 February 1882. On Melvill's death the shell passed into the possession of J. R. le B. Tomlin, whose collection is now in the National Museum of Wales. This is the specimen figured by Sowerby (1847, *Cypraea*, plate 17, fig. 10). Dimensions: length 65mm. (Schilder gives 64mm.), width 38.5mm., height 32mm. This is probably the type of *Cypraea (Erosaria) broctoni* Iredale. The shell is in perfect condition except for a puncture the size of a pin-head on the median line of the dorsum.

SPECIMEN 2

A. E. Salisbury collection, Royal Scottish Museum, Edinburgh. Plate 11, fig. 6. The shell is a typical specimen of *C. guttata* and can readily be distinguished by a fracture on the inner parietal wall which extends over the parietal side of the body-whorl. The shell is labelled New Hebrides. Mr. Salisbury informs me that he bought the shell from G. B. Sowerby, but that its previous history is unknown to him. This shell is probably the one represented by a photograph in the Dautzenberg collection, since the Schilders state in their paper on the Dautzenberg collection of Cypraeidae that the shell is slightly damaged

in the posterior half of the dorsum. The specimen was offered by an unknown collector to Geret, who asked Dautzenberg in a letter dated 28 May 1904 to value it. Dautzenberg did not buy the specimen and its whereabouts were unknown, but from the fracture on Salisbury's specimen it seems likely that the shell passed into the possession of G. B. Sowerby. Dimensions: length 59.5mm., width 35mm., height 30mm.

SPECIMENS 3 and 4

Saul collection, Department of Zoology, University of Cambridge. Previous history unknown; Dr. Anna Bidder informs me that the locality on the label was probably added by Hugh Fulton. Dimensions: length 62mm., width 39.5mm.; length 52mm., width 29.5mm.

SPECIMEN 5

British Museum (Natural History): registered No. 1837. 12. 1.1335. This specimen was purchased from W. J. Broderip and formerly belonged to Henry Constantine Jennings of Chelsea, whose collection was sold by Philipps in 1818. It is figured by Reeve (1845, pl. 8, fig. 30); locality unknown. Dimensions: length 62mm. (Schilder 63mm.), width 39mm. (Schilder 37mm.), height 30mm.

SPECIMEN 6

British Museum (Natural History): registered No. 1926. 9. 29. 1. This shell was purchased from J. Hobson in 1926, the locality being given as New Hebrides. This specimen appears to approach *azumai* Schilder and is presumably the one referred to by Joyce Allan (1956) as having been found in New Britain by Hobson in 1879. Dimensions: length 61mm. (Schilder 64mm.), width 37mm. (Schilder 39mm.), height 30mm.

SPECIMEN 7

Rijksmuseum van Natuurlijke Historie, Leiden. Locality Red Sea. Purchased in 1827 at the auction of the collection of J. Raye of Brekel-erwaert. Dimensions: length 66mm., width 41mm., height 33mm.

SPECIMEN 8

Zöologisch Museum, Universiteit van Amsterdam; from the collection of G. de Serière. Plate 11, figs. 3-5. Locality Moluccas. Dimensions: length 68mm., width 41mm., height 33mm.

SPECIMEN 9

In the collection of Mr. and Mrs. Crawford Cate, Los Angeles, U.S.A. The shell is in perfect condition and was collected alive in January 1962 at Ifalik Atoll in the Western Caroline Islands by a native diver, who traded it for a packet of cigarettes. The shell was shown to Dick Willis who immediately recognised it and informed Cliff Weever, who bought it for an undisclosed sum, the proceeds being used to send some of the natives, girls or boys, to school at Suva. Cliff Weever sold it to Mr. and Mrs. Crawford Cate. Dimensions: length 62.5mm., width 37.9mm., height 29.4mm.

SPECIMEN 10

In the collection of Mr. Amiot of Santa Clara, California, U.S.A. Locality unknown. This shell was displayed in the Los Angeles County Museum some years ago and was exhibited at the Convention of the

American Malacological Union (Pacific Division) at Asilomar, Monterey County, California, in 1959.

SPECIMEN 11

In the collection of Professor Masao Azuma, Nishinomiya, Japan. This shell was collected on 30 March 1955 from among refuse at Kochi, Tosa Bay, on the east side of Shikoku Island, Japan. A fisherman stated that the refuse had come from his lobster pots which had been trawled just outside Tosa Bay, at a depth of about 120 fathoms, between 32° and 33° north latitude. The shell is faded and was probably empty when dredged up. It differs from typical *guttata* in being more elongate oval in outline, with finer teeth on the inner lip. This specimen is the type of subspecies *azumai* Schilder (1960). Dimensions: length 55mm., width 33mm., height 26mm.

SPECIMEN 12

In the collection of Tokio Shikama, Japan, who bought it from H. Hamaji, in Wakayama Prefecture, who had obtained it from a fisherman at Tatsugahama, Arita City, south of Wakayama City. The fisherman stated that he had obtained the shell whilst trawling in the Kii Channel between Wakayama and Tokushima Prefectures, north of Cape Hinomisaki. The specimen was collected dead and is the second example from Japanese seas. Dimensions: length 60.5mm., width 35mm., height 25mm.

SPECIMEN 13

Zoologisches Museum, Berlin. Plate 11, figs. 1, 2. This is the type specimen of *C. guttata* Gmelin. Dr. R. Kiliass informs me that its locality is unknown; it was collected by Paetel and determined as the type by Schilder. Dimensions: length 53mm., width 35mm.

SPECIMEN 14

Formerly in the Mollusca Department, Philadelphia Academy of Natural Sciences, U.S.A., presented by Dr. Theo B. Wilson. Dr. R. Tucker Abbott informs me that it was stolen about 1936 and its present whereabouts are unknown.

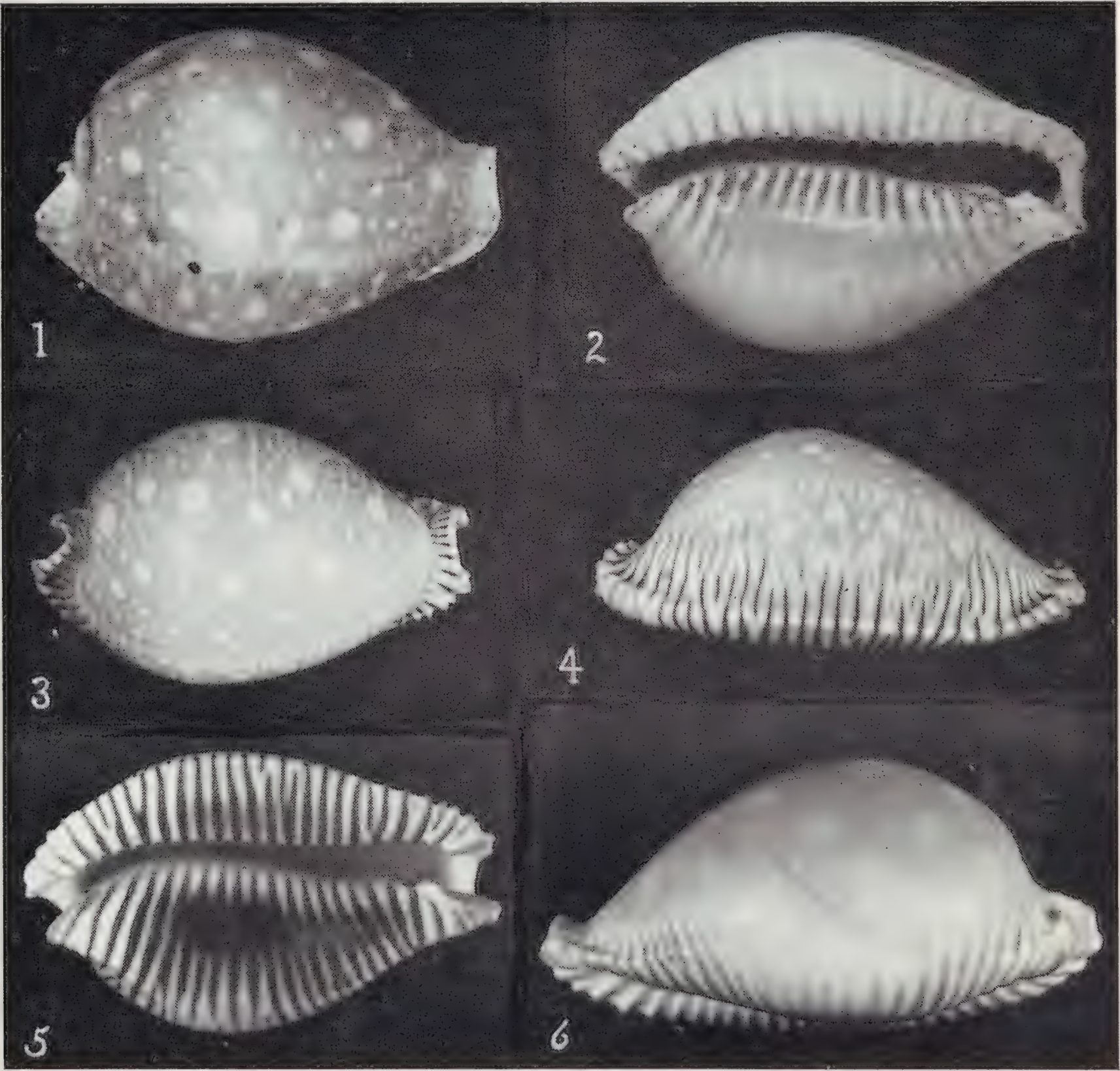
SPECIMEN 15

The whereabouts of the specimen referred to by Julia Rogers (1951, 131) is unknown. It was in the possession of John Ritchie of Boston, U.S.A. After his death his collection was purchased by the shell dealer Walter F. Webb, who died a few years ago. This specimen of *C. guttata* may possibly be the one in the possession of Mr. Amiot.

SPECIMEN 16

Presumably in the Museum at Dijon, France. This specimen, according to J. C. Melvill (1888), was the one referred to as having been in the collection of Dr. Prevost, after his death passing into the possession of M. Grasset of Algiers, from whom it passed into the Museum at Dijon.

From the above, it is evident that there are definitely 13 specimens of *Cypraea guttata* in existence, whilst confirmation of specimens 14, 15 and 16 would raise this number to 16. Further research may well add to this number.



CYPRAEA GUTTATA GMELIN.

ACKNOWLEDGEMENTS

The list of those who have helped in my inquiries is indeed too long for publication, but I would particularly like to thank Mr. R. P. Scase for his suggestions and for reading through the manuscript, and the Director of Birmingham Museum and Art Gallery for allowing me the facilities to carry out this investigation. For permission to use the photographs reproduced on plate 11, I am indebted to the authorities of the Zoologisches Museum, Berlin; the Zöologisch Museum, Universiteit van Amsterdam; and the Royal Scottish Museum, Edinburgh.

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EXPLANATION OF PLATE 11

Cypraea guttata Gmelin

- Figures 1 and 2. Holotype, Berlin Museum.
 Figures 3, 4, 5. Moluccas, G. de Serière, Zöologisch Museum, Amsterdam.
 Figure 6. A. E. Salisbury collection, Edinburgh; photo by R. F. Cumberland.

THE *PISIDIUM*-FAUNA OF BROMBOROUGH, CHESHIRE

By NORA F. McMILLAN

(Read before the Society, 20 April, 1963)

SUMMARY

The *Pisidium*-fauna of different habitats (streams, springs, marshes, ditches, marl-pits, a brick-pit, etc.) of the Bromborough district, Cheshire, is listed and discussed. Ten species have been obtained, including the rare *P. pseudosphaerium* (Favre) Altena.

INTRODUCTION

In this paper an attempt has been made to ascertain the *Pisidium*-fauna of a variety of habitats in a Cheshire district. Disused water-filled marl-pits are a characteristic feature of the Cheshire landscape and their molluscan fauna (other than *Pisidium* spp.) has been surveyed in an earlier paper (McMillan 1959). To this paper the present account forms in part a supplement and reference should be made to the earlier paper for the history of marl-pits and of their Mollusca. As before, the term "Bromborough area" has been used for a rather larger area covering Poulton-cum-Spital and parts of Thornton Hough, Raby, Brimstage and Eastham, as well as Bromborough proper.

METHODS

Every one of the 172 pits listed in the 1959 paper was sampled for *Pisidia*, care being taken that the specimens were all gathered from a small area usually one or two feet square. Frequently the sampling was repeated later, especially if the first trial was fruitless. Possibly a longer list of species could have been obtained if a more intensive search had been made of some of the more promising loci, but this was not done because the intention was to ascertain the species of *Pisidium* characteristic of each habitat in the area studied, and the rarer species were not specially sought. *Pisidia* were also collected from the various streams, springs, marshes, ditches, and ponds other than marl-pits.

As regards the identification of specimens, about 60 lots were determined by N. F. McM. and then checked by Mr. A. W. Stelfox, for whose generous help I am most grateful. The remainder, comprising about 100 further lots of material, were kindly determined by Mr. J. G. J. Kuiper.

THE *PISIDIUM*-FAUNA OF THE DIFFERENT HABITATS

(a) RIVERS. There is nothing worthy of the title river in our area. The considerable stream-system known as the Dibbin (though not so designated on any map, where it is referred to as Bromborough Pool in its tidal portion and is nameless afterwards) is better classified under the next heading.

(b) STREAMS. The Dibbin, together with its tributaries, drains some twenty-five square miles of mid-Wirral, and finally enters the Mersey estuary at New Ferry. The last mile and a half of the main stream forms the tidal creek of Bromborough Pool. Rideout (1923) has described the stream-system of the Dibbin and Owen (1947) its geological history. Of its five tributaries the Brimstage Brook near Raby Mere has a bottom of clean sand overlying rock: it holds *Pisidium hibernicum* Westerlund and *P. subtruncatum* Malm and is fast-flowing enough for *Ancylus fluviatilis* to live in it. The main stream flows over boulder clay and the bottom is mostly muddy with some sand; it was sampled in several places and only yielded *P. casertanum* (Poli) and *P. personatum* Malm. Flood-debris of December 1957 contained numerous examples of these two species and a single valve of *P. hibernicum*, probably washed down from the Brimstage tributary.

(c) SPRINGS. Six springs, all situated along the Dibbin valley, were sampled, and all held only *P. casertanum* and *P. personatum*. Two of the springs were highly calcareous (the "petrifying well" and another "petrifying" spring on the opposite side of the valley).

(d) DITCHES. In the Bromborough area there are no large deep draining ditches and the twelve sampled were rather mean affairs, shallow and choked with vegetation. Those not overgrown with plants had mostly been cleaned out too recently to harbour any Mollusca. Seven altogether held *Pisidium* spp.; six contained *P. casertanum* and *P. personatum* with *P. obtusale* (Lamarck) by itself in one ditch at

Bromborough Pool (i.e. close to the early "model village" of that name which is on the south side of the debouchure of the tidal creek similarly named.)

(e) MARSHES. It is difficult to decide at what point a pond becomes a marsh; one marl-pit (no. 78) could usually be crossed—with care—dryshod and looked just a small rushy hollow, yet still held living *Lymnaea palustris*, *L. peregra* and *Sphaerium corneum*. Because of the presence of *Sphaerium corneum*, however, it was included in the list of marl-pits. Several small marshy hollows were searched for Pisidia and the only species obtained was *P. personatum*, except that in one case *P. obtusale* occurred by itself in a wet hollow which was obviously the last remnant of a marl-pit. The usual companion to *P. personatum* in such marshy areas was *Lymnaea truncatula*.

(f) LAKES. There are no lakes in the area studied. The only large water-bodies are the disused mill-pond called Raby Mere and the lake at Thornton Manor, Thornton Hough. Raby Mere has many ducks and swans on it, and the water is run off periodically; conchologically it is almost barren and I have found no Pisidia in it. The lake at Thornton Manor was evolved out of two marl-pits about 1905 and the fauna has not been studied.

(g) MARL-PITS. The origin and history of some marl-pits in the Bromborough area have already been discussed (McMillan 1959) and it is sufficient here to say that the pits are mostly about 200 years old, up to 16 ft. deep, of greatly varying sizes up to about half an acre, and contain water hard enough to suit any mollusk. Against these favourable conditions must be set the fact that marl-pits are necessarily stagnant, being independent of the natural drainage of the district, and often contain much trash in the form of dead leaves, branches, etc. Often the bottom is of smelly black mud and unfavourable to Pisidia; even when present Pisidia are frequently poor depauperate specimens.

172 pits in the Bromborough area were sampled and 82 yielded *Pisidium* spp.; in nine cases no other Mollusca were present. For various reasons the Pisidia of only 70 of the 82 pits which held Pisidia are here considered. In a few cases only fry were obtained and further visits were not practicable; in other cases Pisidia were noted but for some reason specimens were not retained for examination, and sometimes a pit was filled up before a visit to collect Pisidia could be made.

In the 70 pits holding Pisidia the species were distributed thus:

<i>Pisidium milium</i> Held	in 38 pits.
<i>P. subtruncatum</i> Malm	in 29 pits.
<i>P. nitidum</i> Jenyns	in 13 pits.
<i>P. obtusale</i> (Lamarck)	in 8 pits.
<i>P. casertanum</i> (Poli)	in 7 pits.
<i>P. pulchellum</i> Jenyns	in 4 pits.
<i>P. pseudosphaerium</i> (Favre) Altena	in 4 pits.
<i>P. personatum</i> Malm	in 3 pits.
<i>P. henslowanum</i> (Sheppard)	in 2 pits.
<i>P. hibernicum</i> Westerlund	in 1 pit.

(h) PONDS WHICH ARE NOT MARL-PITS. Ten were sampled, a rather miscellaneous assortment, comprising three cattle-ponds, two small woodland ponds, a small "drying pond", a large "ornamental water", a bomb-hole (excavated 1941) and what is thought to be a mediaeval fish-stew, partly cut into rock. Also a large much overgrown pond (no. 106) close to Bromborough Pool, which may have originated in a cut-off tidal creek. Of these habitats the cattle-ponds held *P. subtruncatum* and one *P. milium*; one woodland pond held *P. obtusale* and the other *P. personatum*; the drying pond had *P. casertanum* and the ornamental water abundant *P. subtruncatum* and *P. nitidum*, while the bomb-hole yielded a thick heavy form of *P. subtruncatum*. The "fish-stew" and the adjoining pond no. 106 both held only *P. obtusale*.

(i) MISCELLANEOUS HABITATS. A metal water-trough for cattle near Raby Vale held abundant *P. personatum*, with *Lymnaea truncatula*. A more interesting habitat was an old brick-pit and shallow trenches ancillary to it; the brick-pit (in boulder clay) contained abundant *P. subtruncatum* and *P. nitidum* and 7 other species of Mollusca. The trenches lacked *L. auricularia*, *Planorbis albus* and *Sphaerium corneum* of the brick-pit fauna, but had abundant *Planorbis crista* (absent from the brick-pit) and a quite different *Pisidium*-fauna of *P. obtusale* and *P. personatum*.

SUMMARY OF *PISIDIUM* HABITATS IN THE BROMBOROUGH AREA

No. of loci Species	Stream- System 1	Springs 6	Ditches 7	Marshes 3	Marl-pits 70	Other ponds 10	Total Loci 97
<i>P. milium</i>	—	—	—	—	38	1	39
<i>P. subtruncatum</i>	X	—	—	—	29	4	34
<i>P. casertanum</i>	X	6	6	—	7	1	21
<i>P. personatum</i>	X	6	6	2	3	1	19
<i>P. nitidum</i>	—	—	—	—	13	1	14
<i>P. obtusale</i>	—	—	1	1	8	3	13
<i>P. pulchellum</i>	—	—	—	—	4	—	4
<i>P. pseudosphaerium</i>	—	—	—	—	4	—	4
<i>P. henslowanum</i>	—	—	—	—	2	—	2
<i>P. hibernicum</i>	X	—	—	—	1	—	2

Note:

In every case the number of habitats stated is that containing *Pisidium* spp. and not the total number examined.

These results agree well with Boycott's account of *Pisidium* habitats (1936). Comparison of the Bromborough findings with Boycott's earlier work on the Aldenham Pisidia (1930, table p. 17) shows clearly the superiority of large deep ponds, even though stagnant, over small shallow ones. The seventy Bromborough marl-pits have yielded ten

species of *Pisidium*, whereas the eighty-four Aldenham cattle-ponds had only six species. The additional species at Bromborough are *henslowanum*, *hibernicum*, *pulchellum* and *pseudosphaerium*, and Boycott (1936, p. 138) points out that the first three species are mostly restricted to running water, and that a slow flow may be imitated by increasing the proportion of unoccupied or "free" water, and hence large deep stagnant loci may contain running water species. Such is the case in the Bromborough area, where *Physa fontinalis*, *Potamopyrgus jenkinsi* and *Planorbis vortex* live in some of the marl-pits.

Considering the *Pisidium* fauna of the Bromborough area as a whole, there is nothing unusual about the species found in the stream-system, the springs, ditches, or marshes. The overwhelming preponderance of *milium* and *subtruncatum* (in that order) in the marl-pits and the relative scarcity of *casertanum* in the same habitat were unexpected, but Boycott (1930, p. 17) has previously remarked on the frequency of *milium* in the Aldenham closed ponds "as it generally prefers running water". In the case of the Bromborough marl-pits the greater volume of water available may be the explanation (see previous paragraph).

The most interesting species obtained was *P. pseudosphaerium* (Favre) Altena (McMillan 1962). This rare species has hitherto been taken only in marsh drains at Pevensey (where it was first collected by Mr. Stelfox in 1911), and Lewes, East Sussex, and at Glastonbury, Somerset. It was taken in four Bromborough marl-pits as follows:

Pit No. 3. Large deep pit containing much *Typha*, *Potamogeton* and *Lemna* spp. Surrounded by willows; much trash in water. Other Mollusca: *Lymnaea peregra*, *Planorbis albus*, *P. crista*, *Segmentina complanata*, *Sphaerium corneum*, *S. lacustre* var. *ryckholti*, *Pisidium obtusale*, *P. milium*. Mollusca not abundant.

Pit No. 8. Rather small, heavily vegetated pit. Other Mollusca: *L. peregra*, *P. vortex*, *S. complanata*, *S. corneum*, *S. lacustre*, *P. milium*.

Pit No. 77. Small, deep, heavily shaded. Other Mollusca: *Sphaerium corneum*, *P. milium*.

Pit No. 142. Much *Typha*, many willows shading water. Other Mollusca: *Lymnaea stagnalis*, *L. peregra*, *P. albus*, *S. complanata*, *Acroloxus lacustris*, *S. corneum*.

I regret to have to say that only Pit 3 survives (February 1963); Nos. 8 and 77 have been filled in and No. 142 is used as a rubbish tip and is rapidly being filled also.

Now that *Pisidium pseudosphaerium* has been found in Cheshire marl-pits, a man-made habitat albeit a fairly old one, search should be made for the species in a "native" habitat. The Gowy marshes are suggested as a possibility.

As regards the means by which such small bivalves as *Pisidium* spp. reach isolated ponds, Fernando (1954) has shown that Corixidae (Hemiptera) frequently carry Pisidia, and in the laboratory can fly out of small containers when still carrying the bivalve. Many Corixidae are strong flyers, and species occur in nearly every marl-pit. It seems reasonable to suppose that some distribution of Pisidia has taken place in this way.

ACKNOWLEDGEMENTS

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EDITOR'S NOTE: Kuiper (*Arch. Moll.* **91**: 184) maintains that *Altena* was not the first author to validate the specific name *pseudosphaerium*. In this case it should be ascribed to Schlesch, 1947 (*Proc. Malac. Soc.* **27**: 138).

A NOTE ON *SITALA JENYNSI* PFEIFFER (HELICARIONIDAE)

By BERNARD VERDCOURT

(Read before the Society, 16 March 1963)

The common and characteristic snail originally described as *Helix jenyinsi* Pfeiffer and for many years assigned to *Trochonanina*, was placed by Thiele (1931), after a study of the radula, in the genus *Sitala* H. Adams. Recently, I (1961) have also placed *Trochonanina leroi* Bourguignat in that genus. When a perfectly preserved specimen of the former species was presented to me by Mr. R. M. Polhill, the genitalia were examined to see whether or not they compared, since the shells of the two species are quite different; the genital anatomy also proves to be different. In *S. leroi* there is a large free dart-sac but in *S. jenyinsi* this is lacking. Unfortunately no further specimen has been available in a suitable state to confirm this. The only other spirit material available consisted of a perfect adult shell containing a very contracted animal; it seemed unwise to spoil such a shell for what would quite probably prove to be a valueless dissection.

In Mr. Polhill's specimen from Marafa the body is white with no coloration save for the long greyish caudal appendage, which is 4.5mm. long even in the preserved animal. The mantle also is white and unspotted. There are two vertical linear areas on the integument, near to the genital pore, which are more marked than the surrounding reticulation. The genitalia are shown in figure 1; the female ducts are not mature or the specimen was in a male phase. The right hand ocular retractor muscle passes between the male and female ducts.

No independent dart-sac could be found and Blanford and Godwin-Austen (1908) and Connolly (1939) mention in their generic descriptions that a dart-sac may or may not be present. No clearly defined white flagellum was found either. At the base of the spermathecal duct there is, however, a swollen oblong-ovoid area containing two pilasters, which is I suspect a dart-sac within the meaning of the very loose way that term is employed. The radula was also prepared to check Thiele's account; it measured 3.2mm. in length and 1.9mm. in breadth and consisted of 122 transverse rows of teeth, the formula being 160-170: 1: C: 1: 160-170. The marginal teeth have two equal cusps and the shanks are denticulate on their outer sides, there being 3-4 small, close denticles. The main question is, however, whether or not these African species truly belong to *Sitala*. A discussion of the African Helicarionidae is not possible without a full knowledge of the Asiatic genera. Undoubtedly the African species do not fit well into the Asiatic genera when attempts at the assimilation are made. The type species of *Sitala*, for example, has, according to Godwin-Austen (1908), the penial retractor attached to the epiphallus at the apex of the penis via a distinct caecum, and not as in the two African species attached near to the apex of the penis at the base of the lime gland, i.e. neither of these two species referred to *Sitala* will key down to the correct subfamily in Burrington Baker's key (1941, 208-9). If this placing of the retractor penis muscle is given importance, then the species usually accepted as belonging to, or close to, *Helicarion* Férussac in Africa are much more closely related to the Urocyclid slugs than they are to the Australian snails with very similar shells and quite similar anatomy. Pilsbry said that he was struck by the individuality of the African assemblage, but I am not altogether convinced of this. As usual, of course, conclusions based on one or a few characters are quite misleading. The retractor position does, however, appear to me to cut across natural groupings, e.g. in my subgenus *Montanobloyetia*. At present, for the purposes of an East African check list, I am inclined to leave *Sitala leroyi* and *Sitala jenynsi* in a large composite genus *Sitala*, although each probably deserves the erection of at least a new subgeneric name, rather than to suggest both are Urocyclini (*sensu* Burrington Baker) with a modified radula, which resembles that of true *Sitala* only by convergence. There is, however, some evidence that the latter view may be correct in the presence of a slug in East Africa with a "Durgelline" type of radula (see Verdcourt and Polhill, 1961, 32); the position of the penial retractor was not ascertainable in the poor material available. Detailed study of the nervous systems and other organs may solve these problems. A table is appended showing the distribution of some of the relevant characters in African Helicarionidae. Multiplication of the marginal teeth and other radula variations must not be too seriously interpreted by themselves since they are often adaptations to certain feeding habits.

The material of *Sitala jenynsi* (Pfeiffer) I have examined is detailed below. It is essentially a species of the coastal strip.

DISTRIBUTION

(C = Coryndon Memorial Museum, B = Berlin Museum)

(b = variety with broad, brown band)

KENYA. Kilifi District, Marafa, 25 miles N.W. of Malindi, in *Brachystegia-Cynometra* woodland, 200 ft., Nov. 1961, leg. R. M. Polhill 216 (C) (b).

TANGANYIKA. Tanga District, 5 miles from Bushiri on Pangani-Muheza road, leg. B. Verdcourt (C) and Ngomeni near Tanga, leg. P. R. Hesse (C). Bagamoyo District, Mbiki River near Ruvu, leg. J. Alexander (C). Usaramo District, 29 miles W. of Dar-es-Salaam, under bark of felled tree, 25 July 1954, leg. W. Wilkinson (C) (collector reported caudal appendage to be 3mm. long). Lindi District, Rondo Plateau, leg. T. Claw (C) (very worn). Specimens in B. from Kisemo, Useguha, Tanga, Kiemoni, Kokotoni, Uhehe, Iringa, Kitohai, Magrotto, Pangani Falls, Nderema, Ukwere, Bagamoyo, Ulugurus and Lindi have also been seen.

ZANZIBAR. Without locality (B). 3 miles W. of Mkunduchi, thicket, in rotten branch of tree, 12 Oct. 1954, leg. W. Wilkinson (C) (b). Shore line at Kiwengwa in N.E. of island, leg. Ostheimer *et al.* in Acad. Nat. Sci. Philad. 212514 (C) (typical and b). Chwaka in E. of island, leg. Ostheimer *et al.* in Acad. Nat. Sci. Philad. 214522 (C). Jembiani, 5 miles S. of Paje in S.E. of island, leg. Ostheimer *et al.* in Acad. Nat. Sci. Philad. 213085 (C) (very weathered). Near lighthouse at Mkunduchi, leg. Ostheimer *et al.* in Acad. Nat. Sci. Philad. 213017 (C) (very weathered).

PORTUGUESE EAST AFRICA. Querimba, leg. Peters (B).

Collectors are asked to preserve in spirit any members of this group they encounter, since there is a further problem which needs solving. Thiele described a *Ledoulxia pseudojenynsi* from several localities in N.E. Tanganyika and Preston a *Ledoulxia gwendolinae*. These both resemble *Sitala jenynsi* closely in shape and coloration, but differ a little in sculpture. Thiele's name may well have to sink into Preston's, but dissection is required to elucidate their correct status.

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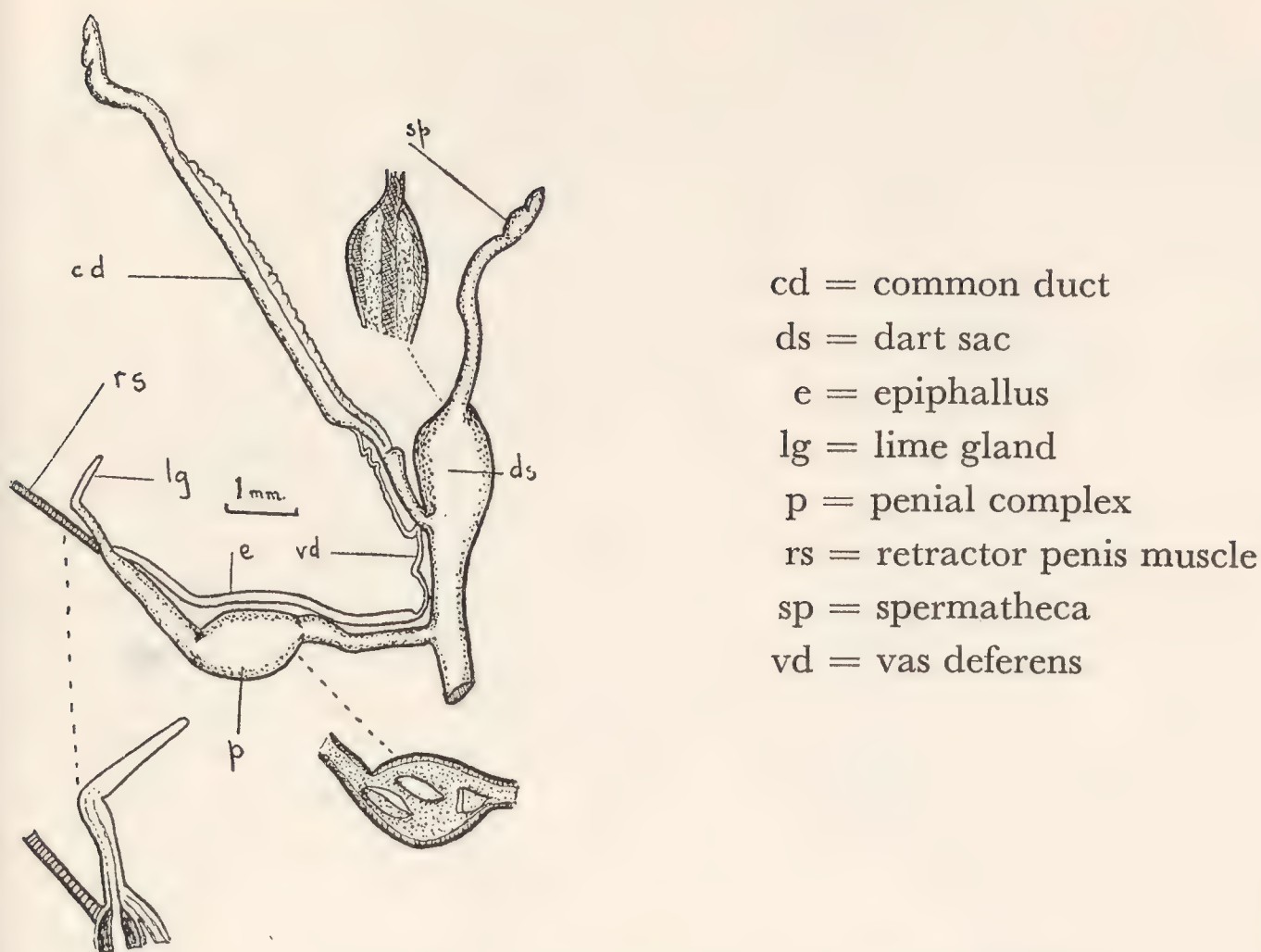


Fig. 1. Genitalia of *Sitala jenynsi* (Pfeiffer)

TABLE
Distribution of characters in some groups of African Helicarionidae

Group (Genus or subgenus)	Retractor Position*	Dart Sac	Radula	Remarks
* A = retractor attached to distal end of the penis, or near to it, at the base of, or near to the free caecum (lime gland)				
B = retractor attached to the end of the caecum which enters the epiphallus near the distal end of the penis				
C = epiphallus without a caecum near distal end of penis and retractor attached to or near to this end				
<i>Africarion</i>	C	nil	marginal cusps bifid	no distinct epiphallus?
<i>Angustivestis</i>	A	small and ovoid		
<i>Belonarion</i>	C	excitatory organ within penial sheath		flagellum developed
<i>Degneria</i>	A	combined with spermathecal duct and containing stimulator	15 laterals, marginals bifid or outer- most trifid	
<i>Entaragicus</i>	A	mushroom- shaped	± 10 laterals, marginals bifid or trifid	
<i>Granularion</i>	A	nil	15-20 laterals, marginals bifid or outermost with obscure additional cusps	

<i>Gymnarion</i>	C	elongate	± 10 laterals, marginals aculeate or bifid, or outermost with obscure addi- tional cusps	no caeca on epiphallus
<i>Mesafricarion</i>	modified A	nil		
<i>Montanobloyetia</i>	A or B	nil	10–20 laterals, marginals bifid	penial gland some- times present
<i>Plicatonanina</i>	B	nil	10 laterals, marginals bifid	
“ <i>Sitala</i> ” <i>bifilaris</i>	B	nil	2 laterals, marginals bifid	ovoviviparous
<i>Sitala jenynsi</i>	A	combined with base of sperma- thecal duct	1 lateral, marginals pectinate	
<i>Sitala leroyi</i>	A	elongate	2 laterals, marginals pectinate	
<i>Sjöstedtina</i>	modified A	nil	10 laterals, marginals pectinate	
<i>Thapsia</i>	B		10–12 laterals, marginals bifid	
<i>Trochonanina</i> (+ <i>Bloyetia</i>)	A	nil	over 10 laterals, marginals bifid	penial gland sometimes present
<i>Trochozonites</i>	B	present or absent	10–12 laterals, marginals 2–3-fid	often ovovivi- parous
<i>Zingis</i> (as interpreted)	B	nil	10 laterals, marginals bifid	flagellum complicated
<i>Zonitarion</i>	A	oval	marginals very numerous with bifid cusps	

EUDOLICHOTUS FROM BRITISH GUIANA

(Pulmonata, Bulimulidae)

By

ALAN SOLEM (Chicago Natural History Museum)

(Read before the Society, 20 April 1963)

Through the kindness of Mr. Tom Pain of London, it was possible to examine sets of *Eudolichotus* from British Guiana that materially extend the range of four species. They were collected by Mr Pain during 1938. The only previous record of *Eudolichotus* from British

Guiana was for *E. aurissciuri* from Dunoon (Baker, 1926: 47). The species of *Eudolichotus* are quite similar in general appearance, and the only illustrated manual (Pilsbry, 1896) is not normally available, so that a key to the species has been prepared.

Key to British Guiana *Eudolichotus*

1. Aperture elongated and strongly constricted, columellar tooth extending about half way across width—2.
Aperture ovate and only slightly flattened, columellar tooth extending less than one quarter way cross width—3.
2. Shell larger (height 52–57mm.), surface heavily malleated, outer lip strongly sinuated, subsutural line indistinct or absent—*Eudolichotus distorta* (Bruguière).
Shell smaller (height 35–44mm.), surface of upper whorls nearly smooth with lower whorls weakly malleated, outer lip nearly straight with only weak sinuation, subsutural line very distinct—*E. aurissciuri* (Guppy).
3. Primary sculpture of radial ribs only, umbilical chink large and conspicuous, columellar margin strongly curved, average H/D ratio more than 2.00—*E. euryomphala* (Jonas).
Primary sculpture of radial ribs and at least a few malleations, umbilical chink closed or barely visible, columellar margin nearly straight, average H/D ratio less than 2.00—*E. glabra* form *grenadensis* (Guppy).

In view of the limited recorded data, it has been thought worthwhile to review the known range of the species. References are given only to the monograph by Pilsbry and the few subsequent citations, since little would be gained by relisting earlier papers. Size variation is summarized in Table 1.

Eudolichotus glabra (Gmelin) form *grenadensis* Guppy

Auris glabra var. *grenadensis* (Guppy), Pilsbry, 1896, 114–115, pl. 41, figs. 38–39. Grenada, West Indies.

Eudolichotus glabra grenadensis (Guppy), Solem, 1960, 418.

Six specimens from the Mazaruni River near Bartica have the heavy parietal callus and fall within the size range of *grenadensis* Guppy, previously known only from the island of Grenada. Two specimens have the parietal callus very thick, in two it is intermediate, and in two it is only slightly thicker than in typical *glabra*. In *E. g. paraguayensis* Solem, 1960, the parietal wall is without a recognizable callus. Typical *glabra* is known from Trinidad and Tobago; the smaller, more heavily callused *grenadensis* is probably an ecological form from Grenada and British Guiana; and subspecies *paraguayensis* has been found on the Paraguana Peninsula of Venezuela. An early record of this species from Surinam (Drouet, 1859: 42, 65) requires confirmation.

Eudolichotus distorta distorta (Bruguière)

Auris distorta (Bruguière), Pilsbry, 1896, 109–112, pl. 40, figs. 21–30, 32.

Auris (Eudolichotus) distorta distorta (Bruguière), H. B. Baker, 1926, 32–33. San Estaban, near Puerto Cabello, Carabobo, Venezuela.

Auris (Eudolichotus) distorta (Bruguière), Arias, 1952, 51–52, pl. 2, fig. 1. Turgua and Los Guayabitos, Region Baruta; El Hatillo, Miranda, Venezuela.

Four specimens collected by T. Pain in the Mazaruni District are typical in shape and sculpture. All have the lip and callus chocolate brown, with the tip of the columellar lamella white. In size and proportions the British Guiana specimens are only slightly larger than those H. B. Baker reported from Venezuela. The typical subspecies is now known from several localities from northern Venezuela. Specimens reported by Arias (*loc. cit.*) are probably from a dwarfed population.

Eudolichotus aurissciuri (Guppy)

Auris aurissciuri (Guppy), Pilsbry, 1896, 112–113, pl. 41, figs. 42–44. Trinidad.

Auris distorta sublaevis Vanatta, 1915 (*non* Pilsbry, 1896), 83. East side of bay near Cariaquito, Venezuela.

?*Auris distorta* Vernhout, 1914 (*non* Bruguière, 1792), 10–11. Paramaribo and Post Groningen, Surinam.

Auris (Eudolichotus) aurissciuri (Guppy), H. B. Baker, 1926, 31–32, 47–48. Dunoon, British Guiana.

Six specimens from the Mazaruni River at Koropong are practically identical in size and shape with the material H. B. Baker saw from Dunoon. The small size of Vernhout's "*Auris distorta*" from Surinam (height 26–40.5mm.) strongly suggests that he mis-identified material of *E. aurissciuri*. The known range would then extend from coastal Sucre in Venezuela and Trinidad south to Paramaribo, Surinam.

Eudolichotus euryomphala (Jonas)

Auris euryomphala (Jonas), Pilsbry, 1896, 116–117, pl. 42, figs. 55–61. Caripe, Monagas and Caracas, D. F., Venezuela.

Auris (Eudolichotus) euryomphala (Jonas), Arias, 1952, 52–53, pl. 2, fig. 2. Los Guayabitos, Region Baruta-El Hatillo, Miranda, Venezuela.

Three specimens from the Roriamá Savannah are considerably larger than those reported by Arias (*loc. cit.*), which averaged only 34.4mm. in height. The range of this species is northern and eastern Venezuela into British Guiana.

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TABLE 1
Size range of British Guiana *Eudolichotus*
E. glabra *E. euryomphala* *E. aurissciuri* *E. distorta*
form
grenadensis

Height				
Mean	35.3	40.7	38.8	54.0
Range	32.5-37.9	38.8-41.7	35.4-43.4	51.8-56.3
S. D.	2.06	1.65	2.92	1.84
Diameter				
Mean	18.3	18.6	16.3	22.0
Range	17.2-19.7	18.1-19.5	15.3-17.4	20.0-22.8
S. D.	0.93	0.77	0.93	1.34
H/D ratio				
Mean	1.92	2.24	2.38	2.46
Range	1.89-1.96	2.13-2.47	2.14-2.56	2.36-2.59
S. D.	0.033	0.196	0.179	0.11
Whorls				
Range	5-5.25+	5.375-6+	5.25-5.625	6-6.125
Apertural length				
Mean	19.0	19.4	20.3	27.1
Range	18.1-20.8	19.3-19.5	18.8-22.6	25.2-28.7
S. D.	1.04	0.12	1.47	1.38
Height/Aperture ratio				
Mean	1.85	2.10	1.91	1.99
Range	1.79-1.99	1.99-2.16	1.87-1.96	1.89-2.06
S. D.	0.073	0.096	0.036	0.083
Number of specimens	6	3	5	4

THE RASHLEIGH COLLECTION OF SHELLS

By STELLA M. TURK

(Read before the Society, 18 May 1963)

Being asked earlier this year by Mrs. N. F. McMillan for any particulars of the life and collections of the Cornish conchologist Jonathan Rashleigh, I was encouraged to look further in the collections and material of the County Museum, Truro. The result of the search added to the short account already given by J. D. Dean (*J. Conch.* **20**: 247). Much of the following information has been extracted from letters exchanged between George Penrose, Curator of the County Museum from 1900 to 1951, C. P. Richards of Stenalees, St. Austell, an ardent Cornish conchologist, and G. B. Sowerby of Sowerby and Fulton. I wish to thank Mr. H. L. Douch, Curator of Truro Museum, for the facts about Jonathan Rashleigh's life and for allowing me to quote from letters accompanying the Rashleigh accession form. Some measure of the work involved in tracing particular specimens may be

gauged from the fact that between the formation of the Royal Institution of Cornwall in 1818 up to 1956 there were nearly a hundred gifts of shells, only one of which was accompanied by a catalogue. There had been no attempt to make a Museum catalogue of the shells until one was started a few years ago.

Jonathan Rashleigh was born on 26 May 1845 to Mary Pole Stuart, the second wife of Jonathan Rashleigh of Menabilly, Par, Cornwall. While the young Jonathan was a student at Cambridge he corresponded with G. B. Sowerby and presumably then started his shell collecting; taking into consideration his years at the University, his two years of marriage and his death at the early age of 27, one wonders if he did much collecting himself or whether indeed his cabinets were filled with bought specimens, built up with the help of such enlightened dealers as the Sowerbys. In 1870 he married Mary Frances Labouchere of Broome Hall, Surrey. They had one child, a son, John Cosmo Stuart, born on 2 July 1872. Only a few months later, on 8 December 1872, Jonathan died, and his wife Mary died soon afterwards in 1873.

For at least 12 years his shells were stored in the Bedford Pantechnicon, London (Melvill, *Cypraeidae*, *Proc. Lit. & Phil. Soc.* 1888—reference not checked: taken *in lit.* C. P. Richards to G. Penrose 18 November 1915). Sometime between 1888 and 1895 G. B. Sowerby was employed to put the collection straight, and he wrote about Jonathan Rashleigh on 15 November 1915 (*in lit.* to G. Penrose) "After his death his collection of shells was found to be in utter confusion in consequence of removal so the labels are mostly if not wholly in my writing". In a letter on 17 November G. B. Sowerby tells Mr. Penrose that he is unable to give him an exact date for the re-labelling of the specimens. "Unfortunately the old a/c books have not been preserved. I can only say that I think it was over twenty years ago that I arranged the collection". The shells were evidently in the keeping of the son until he gave them to the Royal Institution of Cornwall's County Museum in October 1914, just before he went off to the Front (Dr. J. C. S. Rashleigh died a few years ago).

Some of the correspondence mentions particular specimens in the Rashleigh Collection, and in the letter to George Penrose dated 18 November 1915, C. P. Richards quotes from Melvill's *Cypraeidae* (*loc. cit.*):—

"*Cypraea clandestina* L. var. *artuffelli* (*jousseauma*). Is this the same as *C. asellus* var. figured in Sowerby Thes. Conch. pl. 30 fig. 327? It compares well with the plate in Tryon Man. Conch. pl. 16 fig. 61. I recollect this specimen in the collection of my late friend Mr. Rashleigh but have had no opportunity of comparing it as, since his death in 1872 his collections have been packed in the Bedford Pantechnicon, London, and are not in a condition therefore to be consulted".

In the same letter Mr. Richards raised the question of the whereabouts of the type of *C. rashleighana* Melvill. Mr. Penrose replies on 21 November 1915 that *C. rashleighana* is not amongst the cowries and that there is no var. *artuffelli*, although there is a shell labelled "C.

clandestina var.” Mr. Penrose proposed sending this variety together with *C. poraria* var.? *albinella* to Mr. Melvill. There the correspondence ends; no doubt the war was making things difficult and one wonders if the shells were ever sent, or if sent whether they were returned. Certainly cowries labelled *C. clandestina* and *C. poraria* are present in the Truro Collection, but more critical examination of these as of most of the other exotic species is still needed. Only the most generalised data accompanied the olives, cones and cowries of the Rashleigh Collection, and it seems likely that in the “utter confusion” in which Sowerby found them that he may have replaced whatever label data Rashleigh originally used by his own, merely giving the known range of the species.

RAISED BEACH SECTION AT WHITEHOUSE, CO. ANTRIM

By R. MACDONALD

(Read before the Society, 18 May, 1963)

During the severe storms of January 1962, a portion of the sea-wall on the foreshore opposite “Abbeydene Welfare Home” at Whitehouse on the shore of Belfast Loch was demolished by the sea. As a result of the damage to the wall a section of raised beach, 44 ft. in length, was exposed.

The molluscan fauna was confined to one layer, referred to as Shelly Layer (D) in the description of the section below.

The section reading from the top downwards was as follows (the top of the section being at 5 ft. above O.D.):

- (E) Surface soil with stones, 1 ft. 5 ins.
- (D) Shelly layer, 3½ ins.
- (C) Sandy layer, 1 ft.
- (B) Small stones, 6 ins.
- (A) Trias (Keuper beds), top at 1 ft. 9½ ins.

MOLLUSCA

Littorina littorea (L).
Littorina littoralis (L).
Nucella lapillus (L).
Bittium reticulatum (da Costa).
Turritella communis Risso.
Ostrea edulis L.
Spisula subtruncata (da Costa).
Zirfaea crispata (L), fragments.
Cardium edule L.

References to other raised beaches on the Co. Antrim side of Belfast Loch will be found in Praeger, 1897 (*Proc. Roy. Irish Acad.* (3) 2: 33).

My thanks are due to Mrs. N. F. McMillan for examining and naming specimens of Mollusca sent to her; to Mr. A. Fitzsimmons,

M.I.Mun.E., M.I.C.E.I., Town Surveyor of Newtownabbey, of which Whitehouse is a part, for information regarding O.D. level, and finally to my son John Roy MacDonald for assistance in the collection and washing of raised beach material and in measuring the section.

THE FAMILY POSITION OF *AFRIVOLUTA PRINGLEI* TOMLIN

By K. H. BARNARD (South African Museum)

(Read before the Society, 18 May 1963)

Thanks to Mrs. H. Boswell of Pretoria, I have been able to examine a splendid shell of *Afrivoluta pringlei* Tomlin (1947) containing the "animal", recently obtained on the Agulhas Bank. The shell measures 106×45 mm., which is as broad but not quite so long as a specimen in the South African Museum (Barnard, 1959, 24). The animal was withdrawn into the shell, consequently only the foot, head and front of the mantle were adequately preserved. The visceral mass was completely decomposed. By careful maceration in dilute caustic potash the radula was obtained.

There was no operculum, extruded proboscis, nor penis. The head was apparently broad, bilobed in front, the short tentacles arising below the margin of the lobes. Eyes were present, in front of a lateral lappet, the left lappet seemingly larger than the right. The siphon was short and simple.

The anterior one third (about 18 plates) of the radula was folded over ventrally. When unfolded the length of the radula was 5 mm., the width 1.75 mm. There were 60 rachidian plates, each with about 80 slender, subequal denticles, the 3 or 4 at each end slightly smaller. The denticles in each row vary slightly among themselves, and they also vary in successive plates. On some of the plates one denticle approximately in the middle of the row may be broader than its neighbours. It corresponds exactly with the radula of *Marginellona gigas* von Martens (1903, 108, pl. 5, figs. 16, 16 *a*, *b*, shell; Thiele, 1903, 170, pl. 9 (4), fig. 64, and 1929, fig. 431, radula).

Von Martens discussed the systematic position of his new genus, citing as Marginellid characters the absence of operculum, the polished surface and the deposition of shelly substance over the suture. The nearly vertical (axial) columellar pleats, however, were non-Marginellid. Both von Martens and Thiele included *Marginellona* in the family Marginellidae.

Afrivoluta agrees with *Marginellona*, except that it has a thicker walled, heavier shell and prominent pleats projecting nearly at right angles to the columella. It also has eyes: these were stated to be absent in *Marginellona*, but the single specimen of the latter was damaged and the eyes may have been lost.

The radula is clearly an extreme modification of the form found in some Marginellidae, e.g. *M. capensis* Krauss (Barnard, 1959, fig. 1 *d*). No trace of lateral plates was found. Their absence should be checked by dissection of the buccal mass *in situ* in a well preserved specimen, but their presence, even as vestiges, seems unlikely, in spite of the prognostication of Cooke (1922, 8, footnote) that "Some day a *Marginella* with laterals will turn up".

With its *Marginella*-like columella pleats, *Afrivoluta* has an even stronger claim for inclusion in the Marginellidae than has *Marginellona*, and full generic status is amply justified. Accordingly I propose removing *Afrivoluta* from the Volutidae.

It is curious to find two Gastropods markedly different in their columellar pleats, but with identical radulae, inhabiting widely separated regions: *Marginellona gigas* from the Nicobar Islands (805 metres) and *Afrivoluta pringlei* from the Agulhas Bank (approximately 100–250 fathoms).

According to von Martens (1903), the largest known *Marginella* was *M. bullata* Born. The figure given by Sowerby (1846, pl. 57, fig. 158) is 74mm. in length. The broken shell of *M. gigas* was estimated to be 80–100mm. in length. *A. pringlei* reaches a length of 120mm.



A rachidian plate from the radula of *Afrivoluta pringlei* Tomlin: one of the plates which show a slightly enlarged denticle in the middle of the "comb".

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SNAILS INTRODUCED WITH BANANAS

By C. R. C. PAUL

(Read before the Society, 20 April 1963)

About five years ago Mr. K. Klose, who is in charge of the aquarium in the Department of Zoology, University of Cambridge, was asked to collect spiders from Fyffe's banana warehouse, then at Meldreth. Since then Mr. Klose has visited the warehouse, now at Cambridge, more or less regularly once a week and collected anything alive which had been caught by Fyffe's employees during the week. Among these specimens are a considerable number of snails, and it was thought to be of interest to make a record of those species which have so far been collected. They fall into two convenient groups, depending on whether they originate from West Africa (excluding the Canary Islands) or from the West Indies.

West African Species

<i>Achatina</i> (<i>Achatina</i>) <i>achatina</i> L.	2 very immature
<i>Archachatina</i> (<i>Calachatina</i>) <i>marginata</i> ovum Swainson	1 immature
<i>Pseudachatina</i> <i>elongata</i> (Pfeiffer)	2 mature, 1 in December 1962
<i>Limocolaria</i> <i>turbinata</i> Reeve	1 mature and gravid
<i>Gonaxis</i> (<i>Eustreptaxis</i>) <i>blandingianus</i> (Lea)	1 mature
<i>Pseudotrochus</i> sp. indet.	2 very immature

West Indian Species

<i>Oxystyla</i> <i>zebra</i> (Müller)	3 immature and 1 mature, in September 1961
<i>Pleurodonte</i> (<i>Thelidomus</i>) <i>aspera</i> (Férussac)	6 mature

All the Achatinidae are known to be vegetarian and to frequent plantations, but *Gonaxis* is carnivorous and presumably preyed upon the Achatinidae. A notable absentee is *Achatina fulica* (Bowdich), sometimes known as the wandering snail, which has spread throughout most tropical regions, often causing serious damage to crops. As it is a characteristic East African species, its absence can be explained.

Most of the specimens were found alive and were kept for some time in vivaria at Cambridge. All died fairly soon after collection, possibly owing to unsuitable food or insufficient humidity. It is remarkable that they should survive refrigeration, both on the ship and in the warehouse, and the drastic rise in temperature when put into the ripening rooms. This suggests that their ability to survive the conditions of transport is very high and their failure to persist is due to the unsuitability of their new environment. I should be pleased to hear from anyone who knows of similar occurrences.

My thanks are due to Mr. K. Klose for supplying me with the specimens, Mr. T. Pain for identifying them, and Messrs. Fyffe for permitting them to be collected.

JOSEPH WILCOCK OF WAKEFIELD AND HIS PUBLICATIONS

By J. W. JACKSON and N. F. McMILLAN

(Read before the Society, 15 December 1962)

A short paper on Joseph Wilcock and his book, *Illustrations of our British Unionidae* (1888), was published by the late E. G. Bayford and N.F. McMillan (1944), followed by a supplementary note (McMillan, 1950). No further copies of the book seem to have been recorded, and indeed that belonging to E. R. Sykes, which was acquired by J. R. le B. Tomlin, cannot now be found amongst the latter's books in the National Museum of Wales. However, an interesting booklet by Wilcock has come to light, which belonged to Robert Standen, who apparently received it from the author. This measures $5\frac{1}{2}$ inches in height and $8\frac{1}{2}$ inches in width, bound in dark green cloth with 51 uncoloured woodcuts, numbered in ink. Ten of the plates have printed titles, and some of the plates appear also in the *Illustrations*. About a dozen plates are titled in the same distinctive angular handwriting already noted in the *Illustrations*: this is not Wilcock's writing, for on some of the plates he has added comments and initialled them "J.W." in quite a different hand. Some other plates are titled in the handwriting of George Roberts of Lofthouse, who seems to have been in close touch with Wilcock, and one or two other handwritings are also represented in the labelling of the plates.

It seems probable that Wilcock bound up odd lots of his woodcuts in various ways, besides issuing them in the *Illustrations*. Examples are the present booklet of Standen's, and Kennard's set, which had blue paper covers. It has not been ascertained whether the woodcuts were offered for sale, or were distributed among friends and correspondents by gift or exchange.

Wilcock also issued an *Exchange List of British Land and Fresh Water Shells . . . Corrected up to the end of December 1866*. This was a single sheet, price two pence. A good "List of shells found in the Wakefield district" by Wilcock was published in the 12th Annual Report of the *Wakefield Naturalists' and Philosophical Society*, pages 25-31 (1883), where also, in the List of Members, his subjects are listed as Conchology, Botany and Horticulture.

The items referred to in this note, as well as the collection of unbound plates mentioned in Bayford and McMillan (1944, 84), are now in the Zoology library of the British Museum (Natural History).

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OBITUARY

HANS SCHLESCH

1891-1962

HANS SCHLESCH was born in Madras, South India, on 8 August 1891, the son of a Danish missionary. He was, therefore, born a British subject and retained his British nationality till the 1930's, when he became a Danish subject, but till his death he preserved a British flag which, with special permission of the Danish Government, he flew over his home on occasions. After qualifying as a pharmacist in Denmark (1918) he acquired a business at Seydisfjörður in Iceland. In a letter dated 7 May 1945 to Mr. Fay of the Hull Museum Schlesch writes ". . . and during my residence in East Iceland in some months was Acting British Vice-Consul . . ." Thus we have a man of pure Danish blood but with the closest possible ties with England, and very proud of it he was too.

Schlesch's great enthusiasm was for Zoology, but owing to some trivial scientific joke he played when a lad of 15 he was not allowed to study this subject so turned to pharmacology. Apart from a few other places and for short periods, most of this life was spent as a dispenser in Copenhagen.

Hans Schlesch was a prolific writer on Malacology and it is said that his papers amount to nearly 200, and we are glad to hear that Professor C. R. Boettger is listing his works with a view to publication. Some of these are quite substantial, such as his paper on the land and freshwater Mollusca of Latvia; other brief notes were published as "Kleine Mitteilungen" in *Archiv für Molluskenkunde*. All the same some of them were not so very "kleine" as they ran into many pages. It is just here, in these writings of his, that we meet Schlesch as the controversial personality. Did he rush into print without due reflection? Were a number of his species and varieties quite unnecessary? It is true that these questions can be asked of many of us, but they are particularly pertinent with regard to Schlesch. For instance, when the present writer sent a sample of Mollusca from Persia in the early 1930's, with the special request not to describe anything as new but leave that to the finder, Schlesch immediately described one of them as a new species and another as a new variety of a species. The former was placed in the wrong superfamily.

He was a great collector, extremely generous with his duplicates, and many museums and private collections are thereby the richer. So far as we in this country are concerned Hull was the depository of much of Schlesch's collecting. During 1959 the present writer, whilst on a visit to Hull, had a care to ascertain the situation. It appears that he first presented specimens to the collection at the Hull Municipal Museum in 1909, and according to the records this was an extensive donation running into thousands of specimens. Again in 1927 several thousands were sent and in August that year the records show that another 1,800 specimens were received. In one annual report of the



Geo. S. S. S.

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Director of the Museum Schlesch's collections are referred to as running into tens of thousands of specimens. These collections contained the types of many of his species and varieties, and according to Mr. Thurston (curator in 1959) were contained in tubes in cabinets. Then in June 1943 the blow fell. German bombs rained on Hull, the Municipal Museum was razed to the ground. All was lost.

When the shadows of the second world war were lengthening over Europe, Schlesch was in Latvia making the extensive collections on which his work, referred to above, was based. He crossed the Polish corridor by the last train before Hitler struck at Poland, only just in time to save his precious collections and notes. Back in Denmark, when the Germans occupied his country, true to himself and his innate hate of injustice and oppression (we shall see more of this later), he joined the Danish resistance movement and was frequently in grave danger of his life.

Schlesch was elected a member of our Society on 8 May 1918, when he lived at Nestved, Denmark. Later he became a life member. He contributed occasionally to the *Journal of Conchology*. He was a member of a large number of other scientific societies. In 1938 he was honoured by Chicago University with the D.Sc. (*honoris causa*), in 1942 he was honoured by Riga with D.Ph., and in 1950 he received the Linnaeus Medal of the Royal Swedish Academy of Science.

Hans Schlesch married twice, firstly in 1918 Agnete With, by whom he had a son, Arne, now living in New York. His second marriage in 1936 to Gertrud Siersted, a nurse, was only possible after a great controversy, for at that time nurses were not allowed by Danish law to marry. Here the dynamic character of Schlesch comes out again. This is unjust—the law must be changed! He campaigned for this change, even writing personally to his Majesty the King of Denmark. He also enlisted the help of the press. Parliament changed the law, Hans married his nurse. Almost immediately hundreds of Danish nurses married, taking advantage of the new law Hans Schlesch had fought to bring to the Danish statute books.

A year later, 1937, J. J. Bregne, the sculptor, made a bronze bust of the reformer, which was exhibited in the Charlottenborg Art gallery. To the best of my knowledge this was, unfortunately, amongst the Hull casualties, but plaster casts exist in other museums.

On 7 December 1962 he passed from us, and from our midst went this colourful, controversial, generous, mean, attractive, difficult person: our Society lost one of its oldest and utterly loyal members and malacology one of its most devoted workers. Plate 12 shows him in his retirement on the Island of Falstar and was taken but a few days before he died by Dr. H. Waldén of Göteborg, Sweden. We are greatly indebted to Dr. Waldén for permission to reproduce this photograph.

H. E. J. BIGGS

REVIEWS

Report to the Government of Sudan on the Sudanese Shell Industry and Red Sea Fisheries, based on the work of WILLIAM REED. FAO/EPTA Report No. 1489. Food and Agriculture Organization of the United Nations, Rome, April 1962. Pp. v + 47, 6 plates of photographs (figs. 1-17), 3 plates of line drawings (figs. 18-20), 1 chart.

Mr. William Reed, an Australian diving instructor with experience in tropical shell fisheries, was given the assignment in 1958 of advising the Sudan Government on the improvement of the Red Sea shell fisheries. This Report embodies the results of his investigations and his recommendations. The only commercial shells fished from Sudan waters are *Trochus dentatus* and *Pinctada margaritifera* var. *erythraensis*. The former are used mainly for the manufacture of shirt buttons, the latter for larger buttons and inlay work on things like knife handles. Aspects dealt with include methods of fishing, cultivation, and marketing. The world market could probably consume 200 tons per annum of Red Sea shell, but the production of shell in the near future is not expected to exceed 100 tons. It is a pity that the chart cannot be unfolded unless it is detached from the staples.

Between Pacific Tides. EDWARD F. RICKETTS and JACK CALVIN. 4th edition, revised by JOEL W. HEDGPETH. Pp. xiii and 518, coloured frontispiece, 53 half-tone plates (196 figures), 135 text-figures (including diagrams, graphs and maps) + 23 figures of algae. Stanford University Press, California, and Oxford University Press, London. 1963. Price £3 10s. net.

The revised third edition of Ricketts and Calvin by Dr. Hedgpeth contains an account of nearly 500 common littoral species. The descriptive part of the book remains substantially as Ricketts wrote it, divided into numbered sections, each of which deals with the habits and habitat of one species or small group of species. This completes the beginner's portion of the book; an appendix of nearly 100 pages is for the advanced biologist, and contains a classification of the animal kingdom relative to marine representatives, a full bibliography and a list of the chief species in each phylum, with references to the text. The chapter on plankton has been withdrawn, and in its place Dr. Hedgpeth has added chapters on intertidal zonation and on the open ocean beyond the tides. Various littoral habitats are dealt with in chapters on rocky shores on protected and open coasts; sandy beaches in both these environments; bays and estuaries; sand, eel-grass and mud flats; and wharf piles.

The striking feature of the rich Pacific fauna, compared with its European counterpart, is that though species and even genera are often different, the animal types and their modes of life are similar. *Ligyda*, *Leptosynapta*, *Upogebia*, *Glycera*, *Pholadidea* and *Teredo* are examples. Some groups are not well represented, for example, the Polychaetes and the Echinoids. The molluscan fauna does not appear to be as

numerous in species as our own, but this may be because only typical species are mentioned. The chitons were evidently favourites of Ricketts, as evidenced by the frequent mention of them in the text and by the beautiful colour plate as frontispiece.

Bulla is one of the commonest gastropods in the south, and everyone knows about the Californian abalones, species of *Haliotis*. Only three species of scallop are listed. Of the Nudibranchs, so numerous in numbers and species on the Pacific coast, only 16 species are described. There is an exquisite unnumbered plate of *Hermisenda crassicornis*.

The illustrations are numerous and, with a few exceptions, good. Their placing in the book is unfortunate, as they occur in groups at intervals, breaking a sentence in the text. Thus p. 96 ends in the middle of a sentence, plates 1 to 24 follow, and the remainder of the sentence is resumed on p. 145. It should be pointed out once more that the name *Tethys* belongs to a Nudibranch, and that the Tectibranch is *Aplysia*, as laid down by the International Commission on Zoological Nomenclature (Opinion 200, 1954).

The book is well produced and is a most interesting and informative account of the littoral fauna of the eastern Pacific coast of North America. There is a good index. John Steinbeck has written a Foreword.

N. B. EALES

Introduction to seashore life of the San Francisco Bay region and the coast of northern California.

JOEL W. HEDGPETH. California Natural History Guides 9. University of California Press, Berkeley and Los Angeles; Cambridge University Press, London. 1963. Pp. 136; 8 colour plates; map; over 90 text-figures (not numbered). Paper back, 12 × 19cm. Price \$1.95; 15s. 6d.

Dr. Hedgpeth has recently edited the third edition of Ricketts and Calvin, a much larger book on the Californian littoral, but the present Introduction to Seashore Life is his own. It is written for non-zoologists, who may find it difficult to understand the scientific terms, even when explained, but will discover much to interest them. The book commences with a general section on temperature, wave action, tides, zonation and a study of the sea as a medium for living beings. Then follows a key to the chief types of animal life, for amateurs, and this is a queer mixture of phyla, classes, orders and species.

The systematic section deals with common littoral animals. It provides a thoughtful appraisal of the structure, habits and relationships of the members of each phylum, and a short account of the chief species. What surprises the British reader is the paucity of species of worms and Arthropods, though the numbers of any one species may be considerable. The largest section is given up to the Mollusca, to four of its six living classes, namely Polyplacophora, Gastropoda, Bivalvia and Cephalopoda. The first are well represented, the second not very numerous, the third rich in species, and the fourth having only one

species in the shore pools at extreme low water. *Patella* does not occur on the Californian coast, but the common limpets are "a horde of *Acmaeas*". There are few trochids or littorinids. The Moon Snail (*Polinices*) grows to "the size of a large apple". Two unwanted immigrants are *Ocenebra japonica* and *Urosalpinx cinereus*. There are many small but brilliantly coloured Nudibranchs. The commonest bivalves are the mussels, cockles and oysters. Molluscs occupy 30 of the 136 pages of text. Even so, the author remarks "There is no really good book about Californian molluscs".

The colour plates, by several photographers, are variable in quality, some very good, two so dark as to be unidentifiable. Norman Mayer's colour plate of seastars is especially good. The numerous line drawings in the text, mostly by Lynn Rudy, deserve great praise; each is accompanied by a magnification figure. There is a short bibliography, but no index.

N. B. EALES

Marine Molluscs of Victoria. J. HOPE MACPHERSON and C. J. GABRIEL; drawings by G. J. BROWNING. Pp. xv, 475; 486 text-figures. Handbook No. 2, National Museum of Victoria. Melbourne University Press; Cambridge University Press, London and New York. 1962. Price £3 3s.

This volume has been written for the beginner as well as the advanced collector. The authors, one of whom is a life member of our Society, have succeeded in producing a book useful to both. In it they have brought together information previously scattered through many publications. All the more common sea shells of Victoria are described and figured, points of difference between the species being emphasised as an aid to identification. The descriptions are based on shell characters only. In addition, all other species recorded from Victoria are listed under their appropriate genera. Considerable attention has been paid to the taxonomy and some generic names considered to be unnecessary are discarded. The Australian molluscan fauna has of late years become cluttered up with new subgenera and the present authors have taken a step in the right direction by reducing these. Some well known names disappear also: e.g. *Haliotis albicans* Quoy & Gaimard becomes *Schismotis laevigata* (Donovan), but sound reasons are given for such changes. For the benefit of those who desire them, colloquial names are also given.

Full details of distribution in Victoria will be found, together with the general distribution in adjoining states and further afield. There is a useful bibliography and glossary and a completely adequate index. The high standard of Mr. Browning's drawings must be commended; some may feel dissatisfaction with the lack of colour, but this is compensated for in the detail of shape and sculpture. Altogether an excellent work with everything to commend it.

L. W. STRATTON

Contributions to the knowledge of South African marine Mollusca. Part III. Gastropoda: Prosobranchiata: Taenioglossa. K. H. BARNARD. *Annals of the South African Museum*, vol. 47, part 1, pp. 1-199, 37 text-figures. 1963. Price R2.70. The Librarian, South African Museum, Cape Town, South Africa. [Previously published: part I. Toxoglossa: *Ann. S. Afr. Mus.* 44 (4), 1958; part II. Rachiglossa: *Ann. S. Afr. Mus.* 45 (1), 1959.]

This is the third part of a monograph on the marine Mollusca of South Africa. The amount of information given for each species varies considerably. All species are given a very full synonymy. Apart from this, some species have only distributional notes for the world in general and South Africa in particular. In some, features separating them from closely allied species are given, while in many others full descriptions are provided. The text figures illustrate critical species and diagnostic features such as protoconchs and radulae, etc. Under "Remarks" much general information is given. The author records with sadness that some type specimens, sent to other workers for identification, were never returned to South Africa. There is a good bibliography; presumably an index will be supplied when the series is complete. Though primarily intended for the specialist, this work is essential to any student of South African marine Mollusca.

L. W. STRATTON

THE FIRST EUROPEAN MALACOLOGICAL CONGRESS: A BRIEF REPORT

By Rev. H. E. J. BIGGS, F.L.S.

(*Honorary Secretary to the Congress*)

The idea of a Union for European malacologists was suggested many years ago, but no active steps were taken till the 25th Anniversary Meeting of the Netherlands Malacological Society, held in Amsterdam in 1959. At that meeting a committee was set up to draft rules for such a Union, and at the same time the two British Societies, the Conchological Society of Great Britain and Ireland and the Malacological Society of London, were asked to convene a meeting in London to discuss this draft, and to give an opportunity for European Malacologists to meet and exchange views on this and other matters of mutual interest, also to read papers.

Accordingly a committee was set up, consisting of the President, Secretary and one other member of the Council of these two British societies, to explore the possibilities of arranging such a meeting. When these six representatives met for the first time on 8 November 1960 it was agreed to accept the invitation of our Continental fellow workers and to go ahead and stage the Congress for 17-21 September 1962. This Committee met 22 times in the intervening months to plan the details.

It soon became apparent that it would be unwise, not to say impossible, to limit membership of the Congress to Europeans only. The preliminary circular sent out before the committee actually met had produced a wide response, and when the second circular was issued announcing the date and venue of the proposed Congress replies were received from malacologists hoping to attend from countries as far apart as New Zealand and Japan on the one side and from Chile and Canada on the other. The Congress would have to be world-wide.

Not all who originally expressed a desire to be present were able to attend, but the final count at the close of the Congress was 124 members from 20 countries, made up as follows. Great Britain and Ireland 56, United States of America and Germany 11 each, France 10, Netherlands 8, Denmark and Italy 5 each, Sweden 3, Austria, Switzerland and Rumania 2 each, Hungary, New Zealand, Egypt, Australia, Belgium, Norway, Portugal, Canada and Rhodesia 1 each.

In view of the strong representation of the United States of America it was felt that this great country should be represented on the panel of those who were to read a paper at the Congress. We also hoped for a representative from Russia who was prepared to read a paper, so that in respect of speakers we were again truly international and broadly based. Chairmen were selected rather more on personal merits than with a view to their nationality, although we were not unmindful of this aspect. The general plan for subjects for papers was to ensure that most, if not all, branches of the study of Mollusca should be dealt with at least once in the programme by an authority in that branch, and that no worker should feel that in the Congress there was nothing of interest to him or her.

The programme of scientific sessions was as follows; the figures in brackets are the numbers of members and visitors present at the session, the smaller numbers being exact counts and the larger numbers should be considered as having a possible error of plus or minus 5.

On Tuesday afternoon, 18 September (Chairman, Prof. Purcheon), Dr. G. Thorson and Dr. W. K. Ocklemann read a paper on "Eastern Atlantic Molluscs"; Dr. Zinaida Filatova on "Bivalves of Arctic Seas" (paper read by Dr. L. R. Cox, chairman of the organising Committee, in the regretted absence of Madame Zilatova); Mevr. W. S. S. van der Feen van Bentham Jutting on "Fauna of the Zuider Zee" (135). On Wednesday morning, 19 September (Chairman, Dr. P.-H. Fischer), Dr. Vera Fretter read a paper on "The Interrelationships of Monocardian Gastropods", and later Dr. B. Hubendick gave a paper on "Patelliform shape and classification" (115). In the afternoon (Chairman, Dr. A. Zilch), Prof. T. Sorgenfrei took as his subject "Some trends in the evolution of European Molluscan faunas" and then followed Dr. Lothar Forcart on "New researches on *Trichia hispida* (Linnaeus) and related forms". This session concluded with a paper by Dr. H. Waldén on "Terrestrial faunistic studies in Sweden" (85).

On the morning of Friday 21 September (Chairman, Prof. M. de Larambergue), three papers were read on the general subject "Nerve

and Muscle Physiology in Gastropods", the contributors being Dr. Fr. W. Schlote, Dr. N. Postma, and Dr. R. H. Nisbet and Mrs. M. I. Baxter (41). In the afternoon (Chairman, Dr. C. O. van Regteren Altena), we also heard three papers, "Recent population studies on *Cepaea nemoralis* (Linnaeus)" by Dr. A. J. Cain, "Chromosomal Evolution in Euthyneural Snails" by Dr. J. B. Burch (75), and finally "Bases écologiques et raciologiques pour une biogéographie des Mollusques Ibériques" by Dr. C. F. Saachi (44).

On Thursday evening (under the chairmanship of Dr. Alastair Graham) those who lived in Queen Elizabeth College, and a few lucky ones who came in for the occasion, listened to a lecture by Dr. Anna Bidder (Hugh Watson curator of Malacology, Cambridge University) on "The Nautilus". Illustrated by beautiful coloured slides of Pacific Ocean habitats, this lecture was at once scientific and easily understood by the 108 members of the audience. A measure of the popularity, not to say importance, of this lecture can be gauged by the number of questions asked afterwards.

Thursday 20 September was given to field excursions, one to Box Hill, Surrey, to study calciphile Mollusca, and the second to Burnham-on-Crouch for those interested in marine Mollusca. Here visitors saw the work being done on commercial shellfish and visited the oyster-beds and later were shown the work being done in the laboratory. A great debt of gratitude is due to the officers in charge at these two places, Mr. J. H. P. Sankey (Juniper Hall Field Centre, Mickleham) and Mr. A. C. Simpson (Fisheries Laboratory, Burnham-on-Crouch, Essex), who gave themselves unsparingly throughout the day to the interests of the visitors, and were so ably seconded by their devoted staffs. Those who were on these excursions expressed their appreciation in no uncertain terms on their return.

The social side of the Congress was so arranged as to give a maximum chance for making contacts. On the Monday night, 17 September, there was a reception at Queen Elizabeth College, in which most of the members of the Congress were living. This informal gathering was characterised by its warmth and geniality, as malacologists who had corresponded for very many years met face to face for the first time. This was the first opportunity of that close dialogue between men and women with common interests which continued throughout the congress, in season and out of season, at a rising tempo right up to the time of the last meal. Again on Friday 21st at the "Sherry Party" given by the two British Societies, members of Congress and friends met again in informal social contact. This event also gave opportunities for some votes of thanks.

Finally we must look at the main work of the Congress, namely the suggestion for the formation of a European Union. The first discussion took place on the first morning, immediately after Dr. T. C. S. Morrison-Scott, Director of the British Museum (Natural History), had welcomed the Congress in the name of the Museum, for it was in its Lecture Hall that all the scientific sessions were held.

This preliminary discussion went on all the morning, with only a short break for coffee, and it was a good measure of the importance of this gathering and the deep interest in the idea of the formation of the Union when we realise that 21 members of Congress took part in the discussion, some speaking three or four times. Mr. G. I. Crawford was our Chairman. It is not necessary here to detail the trend of the discussions, suffice it to say that one could not help feeling that although Malacological considerations were rightly uppermost, just here and there a wind of politics seemed to be blowing at times. One member of Congress did remark to the present writer that this Union could be a help towards a united Europe.

The outcome of this discussion was that a small committee was formed to draw up definite proposals, bearing in mind the general trend of this discussion. The Committee met a number of times, spending long hours thrashing out details of the constitution, and presented their final draft to a plenary meeting of Congress on Friday 21st at 8.00 p.m. in Queen Elizabeth College.

It was at this final meeting of Congress (again under the chairmanship of Mr. G. I. Crawford) that we began to see the possible difficulties and pitfalls in actually forming the Union. There was never any doubt that the basic idea was right and good. There was not only the difficulty of the exact meaning of words in the English draft prepared by the Committee; there was the fundamental question as to whether the Union should be based in a country having a strong natural tradition for malacology, such as London or Paris, or whether or not it would be better based in a country having a fine tradition for international service, e.g. Switzerland or Denmark.

Then there was some feeling that the main Congress had only just been presented with the draft Constitution and there was little time to translate, although both Dr. Zilch (for German) and Dr. Binder (for French) were at that point wisely co-opted to the chair to make clear translations in the two other languages of Congress. Was there a feeling that the draft was being foisted on the membership? It was obvious that a full discussion of each clause together with translation before voting would take long and weary hours. It was at this point, when no little warmth was being generated, that the Chairman showed his skill. He called for 15 minutes break for private and free discussion. On calling the meeting to order after this recess, the Chairman put it to the meeting "Do you wish to accept the draft as it stands, leaving aside for the moment the election of officers, or discuss each article separately and vote on each one?" There was an overwhelming majority in favour of the former course, the tension was immediately relaxed, and we all realised that the *Unitas Malacologica Europaea* had been born. The officers were then voted for as proposed by the Committee, the *Unitas* based in Switzerland (the exact Canton not decided at the moment), and all present signed the membership list in token of their approval. The chief object of the Congress had been attained, the fruit of several years of work.

Those who are interested and wish to join the Unitas should write to Dr. Adolf Zilch, the first secretary to the Unitas, at the Senckenberg Museum, Frankfurt-am-Main.

DISTRIBUTION STUDIES CONFERENCE: CAMBRIDGE, 1962

On 10 November 1962 a conference devoted to distribution mapping was held at the University Botanic Garden, Cambridge, under the chairmanship of Mr. E. M. Nicholson, Director of the Nature Conservancy, and attended by delegates from eighteen national societies and organizations. The Conchological Society's Recorders for non-marine and marine Mollusca were present.

Dr. F. H. Perring opened the meeting by giving an account of the Botanical Society's very successful 10km. square mapping scheme, which recently culminated in the production of the *Atlas of the British Flora*, and which is being adopted by the Conchological Society for recording non-marine Mollusca. The Botanical Society's mapping machinery, producing printed distribution maps from punched cards, was seen in action. Most of the day was taken up in discussing possible extensions of schemes of this kind to cover the problems of many groups of animals and plants. There was general agreement that it would be very useful if a central recording unit could be set up by the Nature Conservancy, to take over and extend the work being done by the Botanical Society. Data processing equipment of more advanced kinds might also be acquired. No definite conclusions could be reached at this preliminary meeting, but it is expected that plans will be formulated by the Nature Conservancy during the spring of 1963.

M. P. KERNEY, DAVID HEPPELL

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

800th Meeting, held at the British Museum (Natural History), 17 November 1962

The President, Mr. L. W. Stratton, in the chair.

Members Elected

Ben Edward Arnold, P.O. Box 7241, St. Petersburg 34, Florida, U.S.A.

Roy Edward Baker, B.Sc., Nature Conservancy, Furzebrook Research Station, Wareham, Dorset.

Miss Anna M. Bidder, M.A., Ph.D., Department of Zoology, Downing Street, Cambridge.

Miss M. Jane Brockbank, Greenwood, 35 Spring Hill Park, Penn, Wolverhampton, Staffs.

Arthur H. Clarke, Jr., A.B., M.S., Ph.D., National Museum of Canada, Ottawa, Ontario, Canada.

Frank Climo, P.B., Collingwood, Nelson, South Island, New Zealand.

Mrs. Margaret A. Fletcher, F.Z.S., 37 Holland Road, Kensington, London, W.14.

Vicente Beltran Fornés, Ferraz 63, Mádrid, Spain.

Alphonse Ludwig Grass, 5666 Rumble Street, South Burnaby, British Columbia, Canada.

Philip J. Harland, 16 Shaftesbury Way, Toms Lane, King's Langley, Herts.

Mrs. Hilda Jones, Hoathly, 25 Park Road, Ramsgate, Kent.

Walter Karo, Bedford House, 52 Aberdeen Park, Highbury, London, N.5.

Theodore A. Leslie, 883 Craig Street, Belize, British Honduras, Central America.

Frederick Mayer, Eaton's Shell Shop, 16 Manette Street, Soho, London, W.1.

R. A. Newland, 93 Arne Avenue, Parkstone, Poole, Dorset.

Clive A. Stanley, 44 Lansdowne Road, Belfast 15, Northern Ireland.

Mrs. J. A. W. Warners, Beukenlaan 12, Oosterbeek, Netherlands.

Cecil H. Williamson, The Smugglers' Rest, Landaviddy Lane, Polperro, Cornwall.

Communication

"Observations on the occurrence of keeled slugs (*Milax* Gray) in the Glasgow area," by Ronald M. Dobson.

Exhibits

Special exhibit: Strophocheilidae, introduced by Mr. T. Pain; examples of this family of South American land snails were also shown by Mr. and Mrs. Crowley and Mr. J. Cooper.

To celebrate the 800th meeting of the Society, Mr. Castell and Mr. Heppell arranged an exhibit illustrating the history of the Society, which included portraits, minute books, notebooks, etc. Mr. Castell read extracts from the first minute book and gave biographical sketches of the founder members.

Rev. H. E. J. Biggs: *Foxidonta stevensoni* Clench, Malaita, British Solomon Islands.

Mr. J. Cooper: living *Limax cinereo-niger* and *Helicodonta obvoluta*, Stoner Hill, Hampshire.

Miss J. T. Sawyer: marine shells from Corsica.

Mr. R. P. Scase: books, papers and colour slides of cowries; colour photographs of Mrs. Helen Boswell's specimen of *Cypraea broderipii* Sowerby; a newly discovered form of *C. caurica corrosa* Gronow, Ceylon.

801st Meeting, held at the British Museum (Natural History), 15 December 1962

The President, Mr. L. W. Stratton, in the chair.

Members Elected

Mrs. Ellen F. Brown, 30 Carclew Street, Truro, Cornwall.

R. F. Cumberland, 31 Greenridge Road, Birmingham, 20.

Stuart Edward Green, 12 Jubilee Road, Kingswood, Bristol.

P. A. Maddison, 31a Nailcote Avenue, Tile Hill, Coventry.

D. E. Pomeroy, M.A., Department of Zoology, University of Adelaide, Adelaide, South Australia.

Communications

"Dietary extensions in some species of marine Mollusca," by Stella M. Turk.

"Joseph Wilcock of Wakefield and his publications," by J. W. Jackson and N. F. McMillan.

Exhibits

Special exhibit: Littorinidae, introduced by Mr. D. Heppell; Recent and fossil examples were also shown by the President, the Rev. H. E. J. Biggs, Mr. C. P. Castell, Mr. J. Cooper, and Miss L. F. Hanna.

Mr. S. P. Dance: portrait of J. G. Jeffreys and a copy of *British Conchology*, to mark the centenary of the publication of volume 1.

Mr. P. E. Negus: Eocene Gastropoda from Barton-on-Sea, Hampshire.

Mr. T. Pain: species of the subgenus *Calachatina* Pilsbry from West Africa.

Mr. A. E. Shuttleworth: deformed specimens of *Planorbis albus* from a pond in Richmond Park, Surrey.

802nd Meeting, held at the British Museum (Natural History), 19 January 1963

The President, Mr. L. W. Stratton, in the chair.

Members Elected

Lt. Col. C. A. W. Duffield, Pickersdane, Brook, Ashford, Kent.

J. B. Hall, 20A Montgomery Avenue, West Howe, Bournemouth, Hants.

Communications

A letter was read from Mr. G. W. Pitchford about the British species of *Mastra*.

Mr. S. P. Dance gave an address on pre-Linnean conchologists, illustrated by rare books.

Exhibits

Special exhibit: Cypraeidae: examples were shown by Mr. J. Cooper, Mr. C. P. Castell, Mr. R. P. Scase (including *C. episema*), Mr. S. P. Dance and Mr. D. Heppell (including *C. leucodon*). Mr. T. Pain exhibited a collection of *Pila wernei*, including some historic specimens, and Mr. T. E. Crowley some specimens of *Neothauma*, one of which was undescribed.

803rd (Annual General) Meeting, held at the British Museum (Natural History), 16 February 1963

The President, Mr. L. W. Stratton, in the chair.

Members Deceased

The President reported the deaths of F. M. Dyke and Hans Schlesch.

Members Elected

R. J. Croome, Bourne Lodge, Dallinghoo, Woodbridge, Suffolk.
C. D. Drake, 41 Braemar Drive, Highcliffe, Hampshire.
Miss Janet Heppell, 1 Hastings Avenue, Gosport, Hampshire.

Appointment of Scrutineers

Mr. A. W. Jones and Mr. P. E. Negus were appointed Scrutineers.

Election of Auditors

Mr. P. Coxhead and Miss M. Maitland Howard were re-elected Auditors.

Annual Reports

The reports of the Council, the Recorders, the Curator and the Field Meetings Secretary were presented and adopted.

Statement of Accounts

The Hon. Treasurer presented the audited accounts for 1962, which were adopted.

Votes of Thanks

Votes of thanks were approved to the Trustees of the British Museum (Natural History), the Officers and Council, the Editor of the Newsletter, and the Restaurant Manageress.

Presidential Address

The President delivered an address on "Some aspects of Snailing".

Election of Officers and Council

The Officers and Council were declared elected (see page 173).

Exhibits

The President: specimens and maps to illustrate his address.

Mrs. E. M. Crowley: a decayed log inhabited by numerous *Rachis punctata* (Anton) from Garissa, Kenya.

Messrs. T. E. Crowley, T. Pain and F. R. Woodward: Mollusca of Lake Nyasa.

Mr. R. Fresco-Corbu: an exotic oyster (? *O. virginica*) from Brightlingsea, Essex.

Mr. M. Goodchild: shells of *Nassarius incrassatus* and *Ocenebra erinacea* inhabited by hermit-crabs and encrusted by a sponge, *Suberites domuncula*.

Mr. P. E. Negus: fossil shells from U.S.A.

Mr. R. P. Scase: new and rare shells, including: *Fusinus timesus* Dall, off the Tortugas, Gulf of Mexico, an unusually large and fine example; *Voluta complexa* (?), red variety, and *V. grossi*, small banded variety, off Townsville, Queensland; *V. randalli* Stokes, Undine Reef, Queensland; *V. junonia johnstoneae* Clench, off Alabama, Gulf of Mexico.

Report of the Council

MEMBERSHIP. Forty-three new members were elected during the year and three former members reinstated. There have been eight resignations and the names of two members have been erased. The Society has lost three members by death, F. M. Dyke, A. H. Turner and Hans Schlesch. There has been a nett gain in membership of thirty-one, compared with twelve the previous year, and the total now stands at 251, including five honorary and nineteen life members.

MEETINGS. Nine meetings (seven ordinary, one annual general and one special general) were held at the British Museum (Natural History) by kind permission of the Trustees. The special general meeting was for the adoption of revised Rules. The Society also arranged a public lecture by Dr. R. Tucker Abbott. The Society played its part in organising the first European Malacological Congress and, jointly with the Malacological Society of London, entertained members of the Congress to a sherry and cocktail party.

Seven field meetings were held and the increasing interest shown in this aspect of the Society's activities has led to the appointment as Field Meetings Secretary of Mr. T. Pain, whose report follows.

PUBLICATIONS. Volume 25, No. 2 of *The Journal of Conchology* was published on 22 May and No. 3 on 27 July 1962. *The Conchologists' Newsletter* was issued in January (No. 4), June (No. 5) and October (No. 6). It has been decided to reprint the first number of the *Newsletter*.

Field Meetings, 1962

Attendance at all the field meetings was excellent, often far exceeding the expectations of the organisers, especially in view of the considerable distances many members had to travel. On 24 March a joint meeting with the Norwich Paramoudra Club was held at West Runton, under the direction of Mr. P. Cambridge, to study the Cromer Forest Bed. Opportunity was also taken to search the beach for Recent marine Mollusca. Shell Bay, Poole, Dorset, was visited on 8 April under the direction of Mrs. E. M. Crowley and Mr. C. R. C. Paul. In spite of rough weather, some interesting finds were made at this prolific locality. Mr. S. P. Dance led two visits to Burnham Beeches, Bucks, on 20 May and 9 September. On 15 July a visit was paid to White Downs near Dorking, Surrey, to study the Mollusca of chalk downland, under the guidance of Mr. A. W. Jones. At Amberley Wild Brooks, Sussex, on 26 August, members had the benefit of Mr. M. Goodchild's intimate knowledge of the area. The last expedition of the year was to Epping Forest on 21 October, under the leadership of Dr. M. P. Kerney. In conclusion I wish to thank those who organised and led these meetings; without their assistance and co-operation these activities would have been impossible.

T. PAIN

Curator's Report

The dilapidated cabinet in which the Society's voucher collection was kept has been replaced by a cabinet given by the Natural History Museum, for which we are indebted to the good offices of Mr. N. Tebble. Regarding the voucher collection itself, I regret to report that no specimens have been added in 1962.

F. H. COZENS

Recorder's Report: non-marine Mollusca

The following new vice-county records have been authenticated since the last report (Vol. 25, page 93).

Cornwall West (1): *Arion rufus*, Reskadinnick, Camborne, Mrs. S. M. Turk.

Cornwall East (2): *Testacella maugei*, Cotehele House, Callington, Mrs. J. Staal.

Kent East (15): *Cochlicopa lubricella*, *Milax budapestensis*, Hucking, M. P. Kerney.

Kent West (16): *Limax cinereoniger*, Darwin's Bank, Down, J. Cooper.

Gloucester East (33): *Oxychilus draparnaldi*, Cirencester, L. W. Grensted.

Gloucester West (34): *Clausilia rolphi*, Sapperton (south of canal tunnel), L. W. Grensted.

Flint (51): *Cochlicopa lubricella*, near Hawarden, Mrs. N. F. McMillan.

Ayr (75): *Potamopyrgus jenkinsi*, Lincluden, Skelmorlie, W. Russell Hunter (see *Glasgow Naturalist*, 18: 214).

Antrim (114): *Cochlicopa lubricella*, Whitepark Bay, C. B. Goodhart.

Records under the new 10km. square scheme are coming in, although not so quickly as was hoped.

M. P. KERNEY

Recorder's Report: marine Mollusca

The new Marine Census scheme, details of which were circulated to members in April 1962, has now been in progress for about a year; the enthusiastic support it has received has been encouraging. 227 lots of preserved material have been donated to the Voucher Collection, and several hundred other records have been authenticated. I consider the maintenance of a good Voucher Collection to be essential, as reference to the material on which any record is based is then possible at any time. So far, the majority of Voucher specimens have been forthcoming from those Areas between the Thames Estuary and the Scilly Isles, and it will shortly be possible to circulate a provisional list of Category A records for those Areas.

The scheme for producing a series of Identification Keys is under way, though at the moment all the keys in preparation are to bivalve groups. Fretter & Graham's *British Prosobranch Molluscs* (1962) contains references to several species first recorded from British waters since 1932, and consequently not on Winckworth's List. Note of these is made below, together with some other additions and emendations to the British list. The records in most cases are not new, but have not previously been gathered together.

Patella intermedia Jeffreys (= *P. depressa* Pennant). Shells apparently of this species have been collected from Dingle Peninsula, Kerry, by Mr. K. C. Vaughton. This record, which would be a new record for Ireland, has not yet been confirmed by examination of the animal.

Margarites olivaceus (Brown), dredged off N. Scotland and Hebrides in 1-60 fm. (Fretter & Graham, 672).

Skenea millipunctata (Friele), recorded once from W. of Isle of Man, also dredged off Oban (Fretter & Graham, 687).

Littorina aestuarii Jeffreys is regarded by Fretter & Graham as a form of *L. littoralis* (L.). Dr. Fretter tells me this conclusion is based on the examination of a single animal sent to her by Winckworth. I have no recent records of this interesting form, which is possibly

extinct in this country; any information on it would be welcomed.

Cingula inflata (Monterosato) dredged in Clyde Sea Area in 7–10 fm. (Fretter & Graham, 657).

Delete *Ammonicera tricarinata* (Webster), now considered conspecific with *A. rota* (Forbes & Hanley).

Janthina janthina (L.) replaces *J. britannica* Forbes & Hanley and *J. planispirata* Adams & Reeve, which are now considered to be synonymous with *J. janthina*.

Carinaria lamarckii Blainville replaces *C. mediterranea* Blainville. Although Fretter & Graham (563) refer to these as “two heteropods”, they are in fact synonyms of the one species.

Gyrina gigantea (Lamarck)*, off the Saltees Lightship, between Carnsore Point and St. David's Head, in 50–100 fm. (Cooke, *Proc. malac. Soc. London*, **12**, 3).

Turbonilla acuta (Donovan) and *T. delicata* Monterosato: these two species are considered to be conspecific by Fretter & Graham (691). I do not know their reasons for giving priority to Monterosato's name.

The addition of three species of Acochlidiacea has already been noted by Mrs. N. F. McMillan in the Marine Recorder's Report for 1959 (*J. Conch.*, **24**, 416).

Delete *Nucula moorei* Winckworth, now considered conspecific with *N. turgida* Leckenby & Marshall (Allen, *J. mar. biol. Ass. U.K.*, **33**, 457).

Crassostrea virginica (Gmelin). Although occasional dead shells of this species may still be found, I have no evidence that the species still lives in this country. It should probably be deleted from the list, but I would be grateful for information on this point. It seems possible that attempts may be made to replenish some exhausted oyster beds in Scotland with the New Zealand species *Ostrea lutaria* Hutton, which is able to reproduce at lower temperatures than *O. edulis* L. (Millar & Hollis, *Nature*, **197**, 513). I have received from Miss Caroline Hancock many shells of *Crassostrea angulata* (Lamarck) from Fraisethorpe, Yorkshire. I would be interested to know the possible source of these as, so far as I know, the species is not known to live north of Essex.

Delete *Chlamys triradiata* (Müller), now regarded as a synonym of *Palliolum tigrinum* (Müller) (Soot-Ryen, *Proc. malac. Soc. London*, **35**, 111).

Cerastoderma lamarcki (Reeve) is now regarded as specifically distinct from *C. edule* (L.) by some workers (Petersen, *Nature*, **181**, 356). *C. beltica* (Reeve), if not a third species, is probably a form of *C. lamarcki*.

Mercenaria mercenaria (L.), Southampton Water (Heppell, *J. Conch.*, **25**, 23). Now introduced into Poole Harbour; also records of single specimens from Portsmouth Harbour and Newtown, Isle of Wight. Dr. Ansell tells me that certain individuals have spawned at under 19°C., so the colonies may no longer be dependant on warm water effluents for survival.

Mactra corallina (L.). Mr. G. W. Pitchford has pointed out that the typical form, as well as the form *cinerea* Montagu, occurs around our coasts.

* The correct name for the species previously known as *Gyrina gigantea* (Lamarck) has now been shown to be *Ranella olearium* (L.). (Dell & Dance, *Proc. malac. Soc. London*, **35**, 159).

Lutraria angustior (Philippi). This species has previously been confused with *L. lutraria* (L.) (Holme, *J. mar. biol. Ass. U.K.*, **38**, 557).

Alloteuthis subulata (Lamarck). This has previously been confused with *A. media* (L.).

I would like to end by thanking all those who have contributed records and specimens to the Census, and hope that others may join them. There is still ample scope for contributing new records, particularly from Scotland and N.E. England.

DAVID HEPPELL

804th Meeting, held at the British Museum (Natural History), 16 March 1963

The President, Mr. L. W. Stratton, in the chair.

Members Elected

William Frederick James Bygrave, 86 Vaughan Gardens, Ilford, Essex.

Miss Eleanor Frances Alison Fogan, 181 New Brook Road, Atherton, Manchester.

Antonio Iglesias, Apartado 114, Tarragona, Spain.

Mrs. Rebecca P. Ritchie, Dock Ledge, Marblehead, Mass., U.S.A.

Ronald Keith Tattersall, 12 Weddell House, Ernest Street, London, E.1.

Communications

"The *Pomacea flagellata* complex in Central America", by T. Pain.

"A note on *Sitala jenynsi* (Pfeiffer)" and "A contribution to the Mollusca of northern Somaliland", by B. Verdcourt.

"*Cypraea guttata* Gmelin, a list of known specimens," by F. R. Woodward.

Exhibits

Special exhibit: Mutelidae.

Mr. G. A. S. Barnacle: *Cleopatra ajanensis* Morelet, Seychelles.

Rev. H. E. J. Biggs: *Caelatura aegyptiaca* (Caillaud) and *Mutelina singularis*, Bahr-el-Faráouniyeh, Egypt.

Messrs. C. P. Castell, P. Negus & M. Goodchild: a copy of Solander's *Fossilia Hantoniensia*, 1766, and fossils collected by Brander from the Barton Beds, with some collected in recent times for comparison.

Mr. C. F. Hemming: specimens and photographs to illustrate Dr. Verdcourt's paper on Somaliland.

Mr. T. Pain: *Pomacea ghiesbrechtii* (Reeve) from Central America.

Mr. R. P. Scase: *Cypraea albuginosa* Gray, dark specimen from Guaymas, Mexico, pale specimen from "Gulf of California"; *C. boivinii* Kiener, Kuta, Bali, a series to show variation in colour and markings from one locality; *C. macandrewi* Sowerby, Red Sea, very rare in such fine condition, together with 3 beach shells and one subfossil for comparison; *C. turdus turdus* Lamarck, var. *distinguenda* Schilder, Red Sea; *C. vredenburgi* Schilder, Kuta, extremely rare in such fine condition (most specimens in collections are worn beach shells and are from S.W. Java).

**805th Meeting, held at the British Museum (Natural History),
20 April 1963**

The President, Mr. L. W. Stratton, in the chair.

Members Elected

Miss D. Beatty, 1 Delaware Dell, Buckland Estate, Dover, Kent.

R. A. D. Markham, B.Sc., 193 Rosehill Road, Ipswich, Suffolk.

Miss M. A. Muirhead, 27 South Monterey Drive, Hope Pastures, Kingston 6, Jamaica, West Indies.

Frederick Michael John Pinn, 62 The Drive, London, N.W.11.

Communications

"*Eudolichotus* from British Guiana", by Alan Solem.

"Snails introduced with bananas," by C. R. C. Paul.

"*Pisidium* fauna of Bromborough, Cheshire", by Mrs. N. F. McMillan.

Exhibits

Special exhibit: Clavagellidae, introduced by Mr. D. Heppell; examples were also shown by the President, the Rev. H. E. J. Biggs, Mr. C. P. Castell and Mr. R. P. Scase. The President exhibited *Mercenaria mercenaria* taken at Southampton at Easter, specimens to illustrate Dr. Solem's paper were shown by Mr. T. Pain, and *Nannamoria parabola* Garrard, a rare deep sea Volute from off Moreton Island, Queensland, 120 fathoms, by Mr. R. P. Scase.

**806th Meeting, held at the British Museum (Natural History),
18 May 1963**

The President, Mr. L. W. Stratton, in the chair.

Members Elected

C. L. Bellamy, C.E., The Fountain, The Esplanade, Ventnor, Isle of Wight.

Miss Joan Mary Blyther, S.R.N., S.C.M., Matron's Office, New Maternity Hospital, P.O. Box 5, Kuwait, Arabian Gulf.

Miss Pat Collins, Boscolla, Florence Place, Falmouth, Cornwall.

Ivo Flasar, Teplice Lázně v C., Zámecké náměstí 14, Czechoslovakia.

Charles Milson, A.R.C.A., 15 Carsington Crescent, Allestree, Derby.

R. Phillips, Town Hall, St. Mary's, Isles of Scilly.

Donald Geoffrey Pickrell, 59 Heathwood Gardens, Charlton, London, S.E.7.

David H. Stansbery, B.S., M.S., Ph.D., Curator of Natural History, Ohio State Museum, Columbus 10, Ohio, U.S.A.

Communications

"The Rashleigh collection of shells", by Stella M. Turk.

"Raised beach section at Whitehouse, Co. Antrim", by R. MacDonald.

"The family position of *Afrivoluta pringlei* Tomlin", by K. H. Barnard.

"*Unio kendalli* Jackson, with description of new species", by F. R. Woodward.

Exhibits

Special exhibit: shell-bearing Cephalopoda, introduced by Dr. Anna Bidder, who gave an account of *Nautilus* illustrated with specimens and slides; other exhibits were shown by the President, and by Mr. D. Heppell and Mr. C. P. Castell from the British Museum collections.

Mrs. Llewellyn Jones: marine shells collected on field meetings at Camber Sands, Sussex, and the Isle of Wight.

Mr. T. Pain: *Pomacea maculata* Perry, R. Amazon, the largest species of freshwater Gastropod.

Mr. R. P. Scase: rare Australian shells, including: *Voluta nodiplicata* Cox, taken in a crab-pot in 34 fathoms S.W. of Rottnest Island, Western Australia; *Cypraea hammondae* Iredale, Moreton Bay, Queensland; and a remarkably fine specimen of *Cypraea friendii vercoi* Schilder, Esperance Bay, Western Australia.

The genus *Dyakia*: addendum—Dr. Alan Solem has kindly drawn my attention to the omission from the synonyms of *D. regalis* (p. 144) of *Dyakia duumvirorum* Haas, 1951 (*Fieldiana*, 31: 624, fig. 133).

F. F. LAIDLAW

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BISHOP, E. O., Chemical Laboratory, University of Sussex, Brighton.

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HUNTER, Professor W. D. RUSSELL, Department of Zoology, Lyman Hall, Syracuse University, Syracuse 10, New York, U.S.A.

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TUCKER, Mrs. D. M., Charleton House, Brown's Hill, Dartmouth, Devon.

ACCOUNTS FOR THE YEAR ENDING 31 DECEMBER, 1962

Income and Expenditure Account

[illegible]

Reserve and Research Fund

Dr.		Cr.
To Amount of Fund, 31 December 1961 ..	£ s. d. 482 0 10	
Amount transferred from General Account ..	500 0 0	
Dividend and Interest	30 18 5	
	<u>£1012 19 3</u>	
		By Census printing and cards ..
		Amount of fund, 31 December 1962 ..
		£ s. d. 21 19 3 991 0 0
		<u>£1012 19 3</u>

Life Membership Fund

Dr.		£	s.	d.
To Amount of Fund, 31 December 1961	..	589	14	0
Additional Member	..	20	0	0
Dividend and Interest	..	18	6	0
		£628	0	0
		£628	0	0

	£	s.	d.
By transfer to Income and Expenditure Account	18	0	0
Amount of fund, 31 December 1962	610	0	0
	£628	0	0

Dividend and Interest Account

To 4½% Defence Bonds	..	..	£	s.	d.
4% Funding Loan	..	..	9	0	0
3½% War Stock	..	..	16	6	6
5% Treasury Bonds	..	..	1	8	4
3% Funding Loan	..	..	12	5	0
3½% Defence Bonds	..	..	3	0	0
3% Savings Bonds	..	..	28	0	0
4% British Gas Bonds	..	..	3	13	6
Income Tax refunded	..	..	9	16	0
Post Office Savings Bank	..	..	12	8	0
	..	..	10	5	8
	..	..	£106	3	0

Balance Sheet

[illegible]

NOTE: In addition to the Assets shown above are outstanding subscriptions and stocks of publications.
Examined and found correct.

M. Maitland Howard
P. Coxhead

Auditors.

C. A. Raffray,
Hon. Treasurer.
3 January 1963

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Conventions to be observed: single underlining indicates *italic* face, double underlining SMALL CAPITALS, triple underlining LARGE CAPITALS, and wavy underlining bold or **Clarendon type**. Numerals should be arabic, not roman. The title of the paper is in bold capitals, the author's name in roman capitals. When undecided, leave choice of type to the Editor.

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The bibliographical references at the end are arranged as follows:

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2. Year of publication; if there is more than one publication by the same author in one year add *a*, *b*, etc.
3. Quote the *full* title of the paper or book, in the latter case underlined; use initial capitals for the first word, for proper names, geographical names, geological divisions, and taxonomic names above the rank of species (in German nouns have an initial capital).
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6. Where the reference is to a book, the place of publication should be added.

Explanation of plates follows References. Legends for text-figures and plates should be provided on separate sheets, not on the reverse of the pictures.

Examples of references:

- BARNARD, K. H., 1962. Revised list of South African Late Tertiary and Pleistocene marine Mollusca, *Trans. roy. Soc. S. Afr.* **36**: 179-196.
- BOETTGER, C. R., 1962. Zur Systematik der in die Gattung *Pisidium* C. Pfeiffer gerechneten Muscheln. *Arch. Moll.* **90**: 227-248.
- FRETTER, V., & GRAHAM, A., 1962. *British Prosobranch Molluscs*. Ray Society, London.

Mollusks

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ADDENDUM TO pp. 2 & 3 of COVER

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THE *POMACEA FLAGELLATA* COMPLEX IN CENTRAL AMERICA

BY T. PAIN

(Read before the Society 16 March, 1963)

The Central American area from Mexico to Panama is inhabited by a species of *Pomacea*, very abundant and variable to an extent which fills the investigator with dismay. This is *P. flagellata* (Say), the *Pomacea* par excellence of the region and seldom absent from any collection made there. Considering its immense abundance and wide distribution, we may reasonably infer that this species was amongst the first of the genus to reach collectors in Europe, and it may well have been one of the five species of "Pomus" catalogued in the *Museum Calonuianum* by Humphrey in 1797, as suggested by Alderson (1925, 35).

The earliest account of *Pomacea* from this area is that of Say (1827, 22) who described *Ampullaria flagellata*, without a figure and with a very inadequate description. It is, however, the earliest name available for the species. His specimen is said to have come from Vera Cruz Province, Mexico. Jonas (1844, 35) described the same species under the name *malleata*, again without a figure, which omission he corrected two years later (1846). Both names have been used indiscriminately for the species ever since; that of Say, although perhaps less suitable, has priority and must stand.

When in 1851 Philippi published his monograph of the Ampullariidae, he figured a specimen of *flagellata* from Vera Cruz, but confused *malleata* with the quite different *P. reflexa* Swainson from Colombia; his figure (pl. 18, fig. 6), however, undoubtedly represents *flagellata*, and I possess an almost identical shell from Mexico. Philippi's figured specimen of *flagellata* (pl. 9, fig. 7) is by no means typical, but appears to represent a small banded form, of which I obtained similar examples in the Cerro de les Mesas, Vera Cruz, in 1939.

When Reeve (1856) published his monograph of *Ampullaria*, much additional material from Central America was already in Hugh Cuming's vast collection, so it is hardly surprising that the variable *flagellata* appeared in Reeve's work under a number of new names, with vague descriptions and often erroneous localities. Details of these are given in the following synonymy. Reeve did not apparently notice the close and rather obvious points of resemblance between the shell he figured as *malleata* and that of his supposed new species *A. flatalis*, both appearing side by side on the same plate and both said to be from Mexico! He does, however, point out that Philippi is clearly in error in considering *malleata* to be a variety of *reflexa*.

Strebel (1873), who had collected *Pomacea* in Vera Cruz, realised the variability of the species he had collected, and which he correctly referred to *flagellata*. He published a series of excellent outline drawings to show this variation.

The results of a French scientific expedition to Mexico and Central America were published by order of the French Government, and the molluscan portion of this extensive work was entrusted to Fischer & Crosse. Publication covered many years, from 1870 until 1903, that containing the *Ampullaria* appearing in 1890. These authors stated that, "It is nearly impossible at the present time (1890) to recognise with certainty the *Ampullaria flagellata* of Say". They give no figure and declare that they have seen no specimen like the representation supplied by Philippi from a shell collected at Vera Cruz, where Say began his journey to Mexico, also that Strebel shows nothing in his series of figures which resembles it. In 1891, however, Pilsbry, after examination of the types, was able to prove the identity of *flagellata* and *malleata*, one year after the former had been given up as hopelessly unrecognizable. This identity had been suspected by Strebel and by Fischer & Crosse themselves, but had not before been definitely established.

When von Martens (1899) produced the molluscan section of Godman and Salvin's monumental *Biologia Centrali-Americana*, he restricted the name *flagellata* to specimens from eastern Mexico, that is shells of comparatively small size, ovate in form, with an obtuse spire, a very shallow suture and with the outer lip expanded somewhat at the base. His version of *malleata* is a larger shell, more globose, with a more acute spire. As Martens points out, malleation is a feature common to both! He also notes that Say does not mention any malleation in his description, but suggests that the name *flagellata* (lashed, scourged) can hardly be understood otherwise than as an allusion to it. Fischer & Crosse, however, suggest that the name may be derived from the obscure belts adorning the shell, which explanation Alderson (1925, 36) considers the more likely.

G. B. Sowerby (1909, 352) in his revision of the Ampullariidae assembled 22 named forms under 16 headings as varieties of *A. hopetoniensis* Lea (= *paludosa* Say), an entirely distinct species from Florida. These so-called varieties included both *flagellata* and *malleata*!

In the new edition of Martini & Chemnitz (1911-15) the Ampullariidae were monographed by Kobelt. This author dealt at some length with the *Pomacea* of Central America, the section containing figures of *flagellata* and its allies appearing in 1912. He retained both *flagellata* and *malleata* as separate species, although reducing a number of doubtful forms described by Reeve and others to the synonymy of the latter. It is a curious fact that this, the most comprehensive work on the Ampullariidae ever attempted, is entirely ignored by Alderson (1925), who made a praiseworthy attempt to unravel some of the problems surrounding *P. flagellata* and its related forms, but lack of a good series of well localised specimens with which to make comparisons rendered much of his work abortive. His excellent figures and detailed synonymy, however, are contributions of outstanding merit.

Since the turn of the century American scientific institutions have paid increasing attention to the Central American region, and many

expeditions, both large and small, have brought back freshwater Mollusca amongst their collections. The *Pomacea* collected in Vera Cruz, Mexico, by the University of Michigan-Walker Expedition in 1910 were reported upon by Baker (1922). He considered *P. flagellata* and *malleata* to be conspecific and retained *erogata* Fischer & Crosse as a subspecies of *flagellata*, pointing out that this small form lived under somewhat specialised ecological conditions.

In 1957 a collection containing a good series of *flagellata* made during biological investigations in the Selva Lacandona, Chiapas, Mexico, was dealt with in detail by Bequaert (1957, 210) who, correctly in my opinion, made the "giant" race described as *A. ghiesbreghtii* by Reeve (1856) a subspecies of *flagellata*. This author gives the area of distribution of *flagellata* as extending from Vera Cruz Province, Mexico, to Panama and northern Colombia, where the nominate race and the subspecies *P.f. chemnitzii* (Philippi) both occur in the drainage area of the Magdalena River.

From this brief historical survey it will be seen that, although much has already been achieved, many so-called species and subspecies described from the Central American region and obviously related to *flagellata* have been ignored, mainly because the authors concerned had neither sufficient material for comparison nor access to the type specimens. In consequence many inadequately described forms, often based upon single specimens and never subsequently recorded, still clutter up the literature and make the identification of any *Pomacea* collected in this region a matter of much uncertainty and frustration. Opportunity to examine most of the type specimens of these doubtful species, together with the study of a large series of *flagellata* collected personally in Mexico, Guatemala and Honduras at various times between 1937 and 1940, encouraged the writer to attempt the removal of some of the "dead wood" and the following synonymy is offered with that object in view, together with details of such forms as appear from personal acquaintance in the field to constitute distinct biological races and to be worthy of subspecific distinction.

***Pomacea flagellata flagellata* (Say)**

Ampullaria flagellata Say, 1827, 22; Philippi, 1851, 36, pl. 9, fig. 7; Strebel, 1873, 26, pl. 3, fig. 14, pl. 3a, figs. 14 A-K, 15; Fischer & Crosse, 1890, 239; Pilsbry, 1891, 325; Martens, 1899, 405, pl. 23, figs. 1, 4, 4a, b.; Kobelt, 1912, 125, pl. 9, fig. 6, pl. 48, figs. 1-7, pl. 49, figs. 1-3; Alderson, 1925, 35, 38, 42, pl. 9, fig. 7, pl. 10, figs. 2, 4; Baker, 1932, 37.

Ampullaria violacea Valenciennes, 1833, 259; Martens, 1899, 414, pl. 22, fig. 3; Kobelt, 1912, 132, pl. 50, figs. 3, 4; Alderson, 1925, 37.

Ampullaria ochracea Jay, 1836, pl. 3, fig. 8.

Ampullaria malleata Jonas, 1844, 35, 1846, 1, 122, pl. 10, fig. 11; Philippi, 1851, 58, pl. 18, fig. 6; Reeve, 1856, pl. 7, fig. 32; Fischer & Crosse, 1890, 234, pl. 45, fig. 1, pl. 46, figs. 1, 2, 2a, b; Martens, 1899, 411, pl. 22, fig. 10; Kobelt, 1912, 123, pl. 18, fig. 6, pl. 47, figs. 1, 3-7.

- Ampullaria labiosa* (Koch) Philippi, 1851, 58, pl. 18, fig. 5.
Ampullaria lamarckii Philippi, 1851, 67, pl. 21, fig. 5.
Ampullaria retusa (Olfers) Philippi, 1851, 18, pl. 5, fig. 1.
Ampullaria phaeostoma Philippi, 1851, 45, pl. 13, fig. 3; Alderson, 1925, 39, pl. 9, fig. 8.
Ampullaria venetus Reeve, 1856, pl. 4, fig. 17.
Ampullaria hondurasensis Reeve, 1856, pl. 3, fig. 15; Martens, 1899, 420, pl. 24, fig. 7; Kobelt, 1912, 120, pl. 46, figs. 3, 7.
Ampullaria flatalis Reeve, 1856, pl. 7, fig. 13; Kobelt, 1912, 122, pl. 46, fig. 6.
Ampullaria fumata Reeve, 1856, pl. 26, fig. 124.
Ampullaria columbiensis (Sowerby) Reeve, 1856, pl. 5, fig. 25 (*non* Philippi, 1851).
Ampullaria martensiana Nevill, 1884, 10.
Ampullaria strebeli Fischer & Crosse, 1890, 238; Martens, 1899, 415, pl. 22, fig. 2; Kobelt, 1912, 113, pl. 45, figs. 4, 5.
Ampullaria strebeli var. *prasina* Fischer & Crosse, 1890, 235, pl. 48, figs. 4, 4a.
Ampullaria belizensis Fischer & Crosse, 1890, 231, pl. 45, fig. 2, pl. 48, fig. 9; Kobelt, 1912, 131, pl. 50, figs. 1, 2.
Ampullaria flagellata var. *exsculpta* Fischer & Crosse, 1890, 235, pl. 44, figs. 6, 6a-c; Martens, 1899, 410, pl. 23, fig. 5; Kobelt, 1912, 129, pl. 48, fig. 4, pl. 49, figs. 1-6.
Ampullaria malleata var. *arata* Fischer & Crosse, 1890, 235, pl. 44, fig. 6a; Martens, 1899, 410, pl. 7, 8, 10; Kobelt, 1912, 129, pl. 48, figs. 5-7, pl. 49, fig. 6.
Ampullaria occlusa Fischer & Crosse, 1890, 295, pl. 45, figs. 3, 3a-c; Kobelt, 1912, 133, pl. 50, figs. 5, 6.
Ampullaria monachus Fischer & Crosse, 1890, 250, pl. 46, figs. 5, 5a; Martens, 1899, 416; Kobelt, 1912, 134, pl. 50, figs. 7, 8.
Ampullaria yucatanensis Fischer & Crosse, 1890, 240, pl. 48, figs. 3, 3a; Martens, 1899, 420; Kobelt, 1912, 135, pl. 51, figs. 2-4.
Ampullaria eumicra Fischer & Crosse, 1890, 243, pl. 48, figs. 10, 10a; Kobelt, 1912, 136, pl. 51, figs. 5, 6.
Ampullaria lemniscata Fischer & Crosse, 1890, 248, pl. 44, fig. 5; Kobelt, 1912, 137, pl. 51, figs. 7, 8.
Ampullaria innexa Fischer & Crosse, 1890, 242, pl. 44, figs. 7, 7a-c; Kobelt, 1912, 138, pl. 51, figs. 9-11.
Ampullaria malleata var. *prasina* Fischer & Crosse, 1890, 235, 236, pl. 48, figs. 4, 4a.
Ampullaria malleata var. *oajacensis* Fischer & Crosse, 1890, 235, pl. 46, figs. 3, 3a-b.
Ampullaria yucatanensis var. *yzabalensis* Martens, 1899, 420, pl. 24, fig. 9.
Ampullaria hopetonensis var. *flagellata* Sowerby, 1909, 352.
Ampullaria paludosa venetus Kobelt, 1912, 119, pl. 46, fig. 2.
Ampullaria oajacensis Alderson, 1925, 40, pl. 9, fig. 11.

The nominate race of *P. flagellata*, as the synonymy indicates, is variable in the extreme. In general terms, however, the shell may be described as globose, tumid, moderately umbilicated, spire rather acuminate, whorls $7-7\frac{1}{2}$, convex, aperture pyriform-ovate, lip rather effused. The colour of the periostracum varies from pale olive green to deep reddish brown; colour bands of varying width and intensity may be present both externally and within the aperture. A typical adult shell from Vera Cruz Province, Mexico, is 61mm. in height and 58mm. in width. Both smooth shells, often with obscure belts of dark green colour round the body-whorl, and heavily malleated examples, with no trace of external banding, may occur amongst the same population.

Distribution. Central America, from central Mexico to Panama, extending into northern Colombia (Magdalena drainage area).

***Pomacea flagellata livescens* (Reeve)**

Ampullaria livescens Reeve, 1856, pl. 5, fig. 21; Alderson, 1925, 39, pl. 9, figs. 9, 10.

Ampullaria ghiesbreghtii Reeve, 1856, pl. 26, fig. 123; Strebel, 1873, 31, pl. 3, fig. 16.

Pomus giganteus Tristram, 1863, 414.

Pomus columbiensis Tristram, 1863, 414 (non Philippi, 1851, nec Reeve, 1856).

Ampullaria ghiesbreghti Fischer & Crosse, 1890, 233, pl. 47, fig. 8; Alderson, 1925, 44, pl. 10, fig. 5.

Ampullaria malleata var. *chiapasensis* Fischer & Crosse, 1890, 235, pl. 48, fig. 5.

Ampullaria flagellata var. *giganteus* Martens, 1899, 412, pl. 23, fig. 6.

Ampullaria flagellata var. *tristrami* Martens, 1899, 413, pl. 22, figs. 1, 12.

Ampullaria flagellata tristrami Kobelt, 1912, 128, pl. 47, fig. 2.

Ampullaria ghiesbreghtii Kobelt, 1912, 143, pl. 53, figs. 1-3.

Ampullaria paludosa livescens Kobelt, 1912, 118, pl. 46, fig. 1.

Pomacea ghiesbreghti Pain, 1953, 222.

Pomacea flagellata ghiesbreghtii Bequaert, 1957, 210.

[Orthographical Note.—*Ghiesbreghtii* is the spelling used by Reeve, 1856, although the eponym was spelt Ghiesbreght. As an erroneous spelling of a specific name derived from a proper noun is regarded as a *lapsus calami*, Fischer & Crosse, 1890, were justified in emending the spelling to *ghiesbreghti*.]

This is perhaps the most easily recognized and best characterized of the few races or geographical forms of *flagellata*, which may usefully be accorded the status of subspecies. Its distribution appears to be restricted to Tabasco and Chiapas, Mexico, and to Lake Petén, northern Guatemala. Adult shells are nearly globular, usually about as high as the greatest width, sometimes slightly higher or lower. Under optimum conditions it reaches a larger size than any of the other races. Giant specimens are particularly common in Lake Petén, whence Tristram described his *Pomus giganteus*. The measurements given by Tristram were: height 95mm., greatest diameter 90mm., aperture 66×39 mm. The largest specimen recorded by Bequaert

(1957, 211) from Lake Petén is 102.5mm. in height, greatest width 88mm., aperture 74.3×42 mm., about 6 whorls. An adult specimen from Villahermosa, Tabasco, measures 83×75 mm.

The oldest name available for this subspecies is *livescens* Reeve, which has 4 months priority over the same author's *ghiesbreghtii*. One can sympathise with the decision of Bequaert (1957, 212) to use the latter name, since it was founded upon an adult shell with a precise locality, whereas the type specimen of *livescens* is an immature specimen of unknown locality. I have an almost identical shell from the Laguna Ocotal, Chiapas, and Bequaert states that similar examples have been found in Lake Petén, which are undoubtedly young *ghiesbreghtii*. Nevertheless the laws of nomenclature provide that the earliest name must stand, irrespective of the type being immature and unlocalized.

I cannot agree with Bequaert that *A. miltocheilus* Reeve "appears to be no more than a small specimen of *ghiesbreghtii*." It is a globose, solid shell, approaching some of the thick shelled species of the South American genus *Limnopomus* in this respect. *A. lattarei* Reeve, from Guatemala, may be founded upon a similar form, but insufficient material is available for a decision on this point. Alderson (1925, 31), however, did not recognize any relationship between them.

Distribution: Tabasco and Chiapas, Mexico; Lake Petén, northern Guatemala.

***Pomacea flagellata erogata* (Fisher & Crosse)**

Ampullaria erogata Fischer & Crosse, 1890, 251, pl. 46, figs. 6, 6a, 7; Martens, 1899, 422; Sowerby, 1909, 349; Kobelt, 1912, 134, pl. 50, figs. 9, 10.

Pomacea flagellata erogata Baker, 1922, 38.

As pointed out by Baker (1922, 38), *Ampullaria* seem to have a peculiar ability to mature at almost any size, and he records that at places where the snails are abundant specimens 2cm. in height have been seen *in cop*. This was also noted in a Venezuelan species, as well as amongst a small race of *flagellata* from southern Vera Cruz, Mexico, just referred to. I also observed this phenomenon amongst a dwarf form of *flagellata* inhabiting small swamps and temporary pools near Porto Barrios, Guatemala, in 1939. Adult examples taken at this locality showed average dimensions of 35×30 mm. The largest specimen amongst some 50 taken from one pool measured 40×36 mm. The snails inhabiting such localities appear never to reach a large size and so form a quite well-marked ecological race which, as Baker noted, fit the description of *erogata* very well.

P. flagellata erogata resembles the nominate race in general appearance, the principal difference being its much smaller adult size. The spire is often much eroded; the outer lip is very simple or reflected. The periostracum is usually dark olive green, and a series of close-set reddish brown bands are often present within the aperture. It should be borne in mind, however, that these small shells may or may not assume the adult characters, so that those that do have a thickened

peristome are quite a different shape from those that do not. They are not usually strongly malleated, this being a feature developed only in older shells.

Distribution: as for the nominate race, but inhabiting small swamps and temporary pools, especially in grassland which has been burnt over.

***Pomacea flagellata dysoni* (Hanley)**

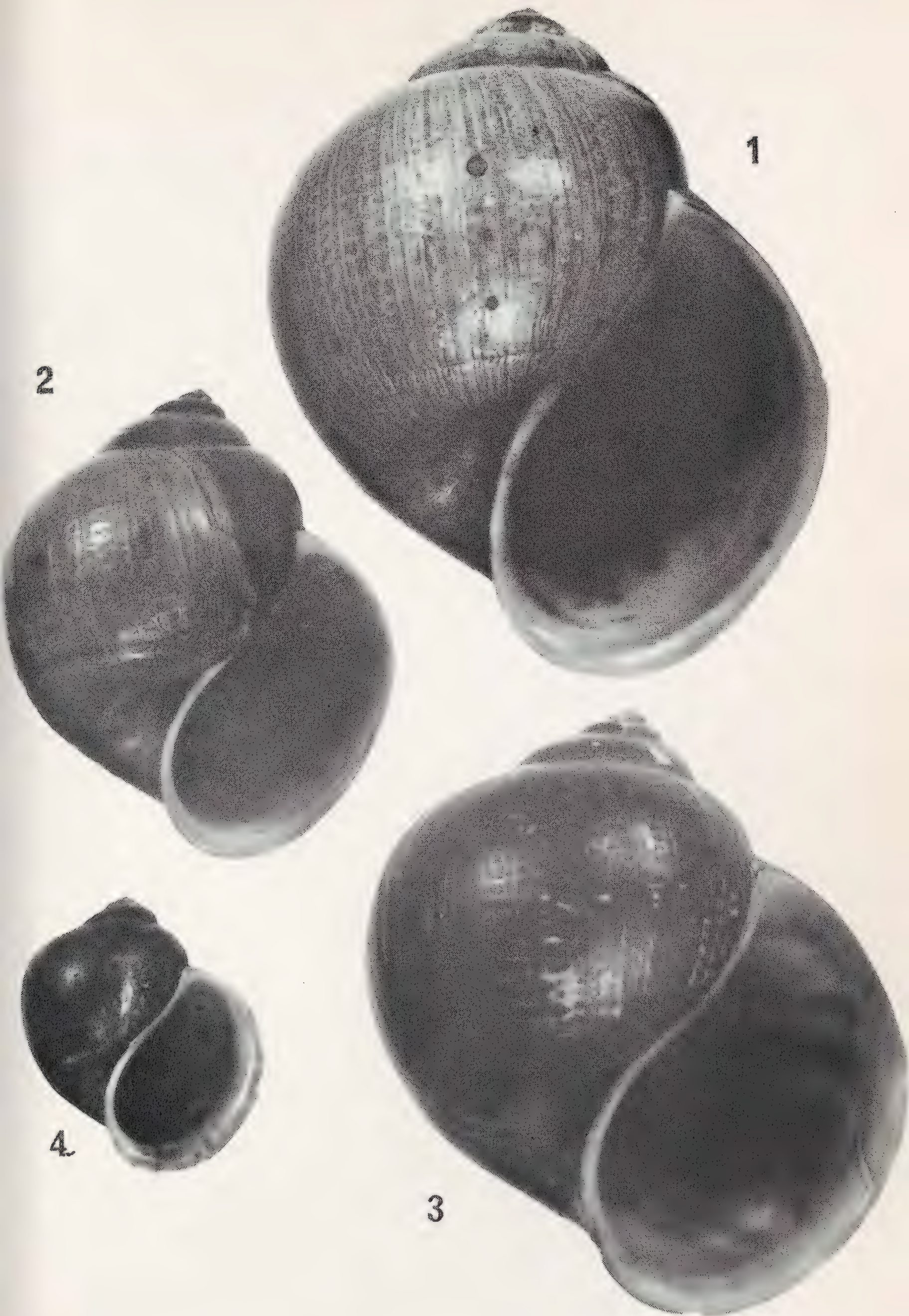
Ampullaria dysoni Hanley, 1854, pl. 2, fig. 1; Reeve, 1856, pl. 11, fig. 49; Martens, 1899, 417; Kobelt, 1912, 110, pl. 44, fig. 1; Alderson, 1925, 43, pl. 10, fig. 3.

Ampullaria hopetonensis var. *dysoni* Sowerby, 1909, 352 (exclusive of much of the synonymy).

It is with some misgiving that this little known and rare form is retained with even subspecific rank. Nevertheless it is perhaps the most striking in appearance of all the *flagellata* group known to the writer and, as Alderson (1925, 43) states, Sowerby is the only author of repute who has denied specific rank to this very remarkable *Pomacea*. Unfortunately the few specimens examined were all said to be from Honduras, without more precise locality. It is hoped, however, that the attention now drawn to it may result in further specimens being identified, when its true position in the *flagellata* complex may be definitely established. It is hardly possible to improve upon the excellent description of it given by Alderson (1925, 43) which is as follows: "The general colour is a peculiar reddish grey, almost exactly the tint of freshly cut cedar wood, darker on the spire, and relieved by a narrow edging to the suture of the body-whorl, and a thick varix on the front of the shell. These are buff yellow. The whole shell is very stout and strong, high polished and much malleated. There are several thin bands, as shown in Hanley's figure, principally in the region of the umbilicus. The interior of the aperture, buff yellow at the top, is, in the main, pale livid reddish, and the peristome is edged with dull orange. The parietal callus is pale marbled with grey from the underlying marks showing through." The shell figured by Alderson measures 63 × 53mm.

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POMACEA FLAGELLATA (SAY):

1. *s.s. livescens* (Reeve). 2. *s.s. dysoni* (Hanley). 3. *s.s. flagellata* (Say).
4. *s.s. erogata* (Fischer & Crosse)

[To face page 230]

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EXPLANATION OF PLATE 13

Pomacea flagellata (Say)

- Figure 1. *Pomacea flagellata livescens* (Reeve), Rio de Tabasco, Tabasco Province, Mexico.
- Figure 2. *Pomacea flagellata dysoni* (Hanley), Honduras.
- Figure 3. *Pomacea flagellata flagellata* (Say), Rio Tecolutla, Vera Cruz Province, Mexico.
- Figure 4. *Pomacea flagellata erogata* (Fischer & Crosse), La Laja, South Vera Cruz Province, Mexico.

NEW OBSERVATIONS ON *ERRONEA VREDENBURGI* SCHILDER (CYPRAEIDAE)

By R. P. SCASE and F. A. SCHILDER

(Read before the Society, 16 November 1963)

It is rather more than 35 years since the cowry *Erronea vredenburgi* was first described (Schilder, 1927) from a single shell collected in south-west Java. Since then numerous examples of this shell have been found, and no less than 1,595 specimens have been examined by one of us (F.A.S.), and full measurements and other data recorded. The majority of these shells were badly beach-worn, and until recently the only live-collected specimen known was in the Senckenberg Museum, Frankfurt-am-Main. This was an immature shell, and the coloration of the perfect adult shell has always been a matter for conjecture.

During 1962 several consignments of small Cypraeidae were sent to England (at the request of R.P.S.) by Mrs. E. Reed, who was living

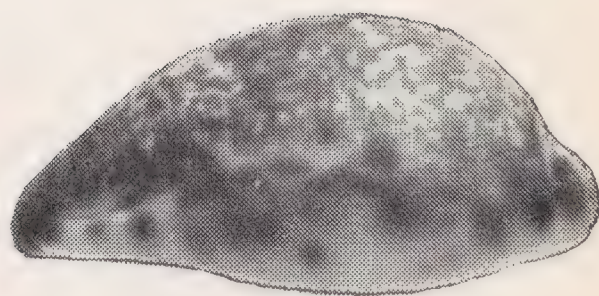
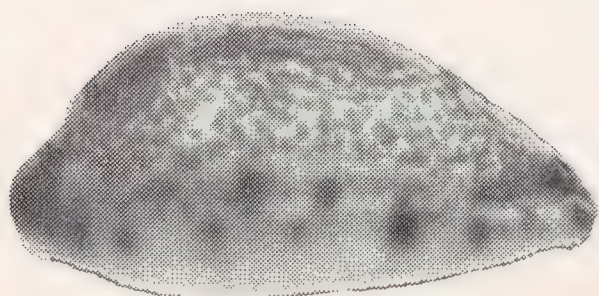
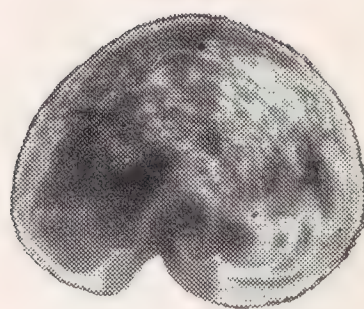
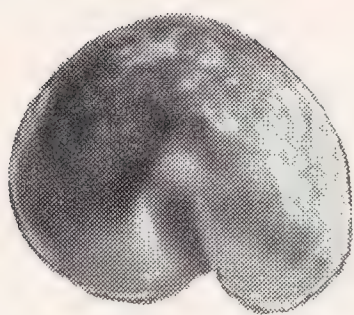
at the time in the south of the Island of Bali, Indonesia, but no specimens of the hoped-for *E. vredenburgi* were present.* Early in 1963 Mrs. Reed finally left Bali, bringing to England with her about a hundred more small Cypraeidae which she had procured from the local inhabitants. These had been mostly collected at Kuta, on the western side of the isthmus just south of Denpasar, though a few were from Sanur, on the eastern side. Among them were four beach-worn shells of *E. vredenburgi*, and also what was immediately recognized to be a perfect adult specimen in live condition. It is therefore possible, at last, to give a full description of the shell of this species, with particular emphasis on the dorsal characteristics, which were not known before.

The general shape when viewed from above is very similar to *E. pallida* (Gray), but at the posterior end the outer lip does not project so far beyond the inner one as in *pallida*. What little can be seen of the background colour is a very pale greyish white with a darker blue-grey area above the posterior extremity, extending to the margin on the left side. The whole dorsum is thickly besprinkled with small olive-brown spots, and under a lens it can be seen that these tend to coalesce, forming a network of short chains; some specimens of *E. pallida* and *E. caurica* (L.) have an identical colour pattern. The spots are heavier and more saturate across the centre of the dorsum, forming a broad darker brown band which extends to the margin on the left side, but only a little way past the centre of the dorsum on the right. The darker background colour of the posterior end gives the impression of a second transverse band, but there are only the faintest indications of one at the anterior end.

The anterior terminal spots are rather small and dark purplish brown, while the posterior ones are somewhat larger and paler in colour, being separated by a small whitish patch extending upwards from the posterior outlet of the aperture. The right side and anterior portion of the left side are margined, both margins being tinged with flesh colour, and impressed in front. There are about eight rather small purplish spots and about twenty *very* small ones along the right margin, and roughly the same number on the left side, where they encroach slightly on the base. The base and teeth are white, the former being slightly suffused with flesh colour towards the margins and at both extremities.

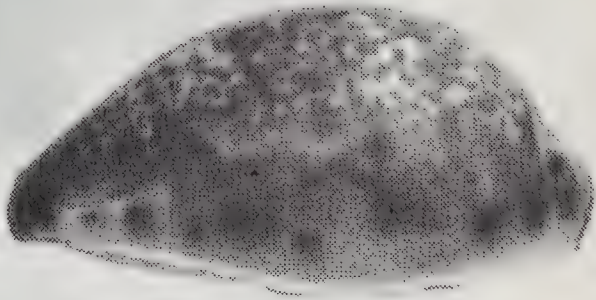
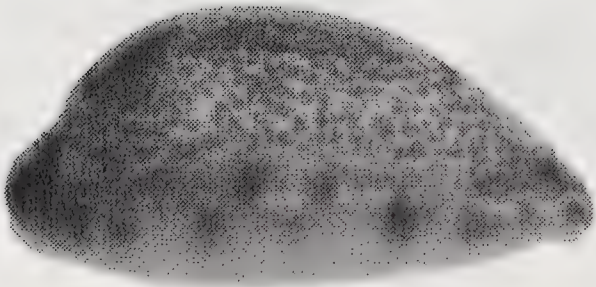
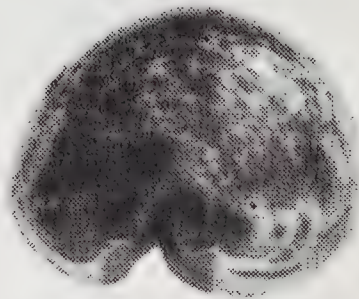
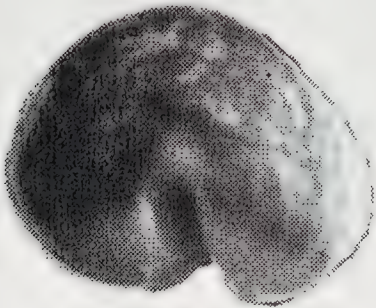
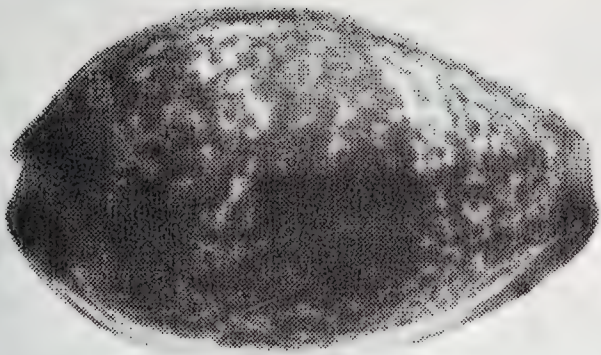
When viewed from the base this species may be easily distinguished from other species, such as *pallida* and *felina felina* (Gmelin), by the inner denticles of the fossula which are very prominent, while the columella exhibits denticles along the greater part of its inner border. The posterior columellar teeth are also set obliquely to the aperture, which

*However, a single beach-worn specimen collected near Denpasar, Bali, was received from Mrs. Reed by the late R. W. Greenish in 1959, and at this time (1962) was in the possession of R.P.S.



ERRONEA VREDENBURGI SCHILDER (x 2)

[To face page 232]



ERRONEA VREDENBURGI SCHILDER (x 2)

[To face page 232

is slightly curved posteriorly but not so much as in *pallida*.

It is usual in cowries to allocate a formula to indicate the dimensions and hypothetical number of teeth for a given size of shell, both in the case of individual shells and, by taking an average or mean figure, for the species as a whole (Schilder & Schilder, 1939, 123–124). It is also possible to indicate the *closeness* of the teeth by using letters of the alphabet (Schilder, 1958). Thus, in *E. vredenburgi* the closeness of the labial teeth may vary from *m* to *v*, though in 90% of the shells measured the range was only from *o* to *r*. Similarly it was found that the closeness of the columellar teeth varied from *i* to *s*, though in 90% of the shells measured the range was from *k* to *p*. The formula* for the species as a whole may be taken as 21.62.21.16 *pn*, this being the average of over 500 specimens measured. The live specimen from Bali is normal in proportions, the formula being 20.61.20.16 *on*, which closely approximates to the mean. The extremes of length in this species were from 12.8 to 30.7 mm., though the length of 90% of the shells varied only from 16 to 25 mm. Similarly the extremes of breadth, in adult shells only, were from 55% to 71% of the length, though the figures for 90% of those examined were from 59% to 66% of the length.

Finally, mention may be made of the distribution of this species, which is fairly limited. It is thought that all specimens so far collected have been from south-western Indonesia, and the majority from south-west Java: Palabuan [not Palawan, as first reported]; Wijnkoopsbaai; Tjilaut Eureun, near Pameungpeuk. There are doubtful records from the north end of Sunda Strait, from Boesak, north-west Celebes and from the extreme south-east of Sumatra. Bali is, therefore, an eastward extension of the range. It is significant that these specimens were found on the *south* coast of the island, for in Java the north coast shows affinities to the Philippines, while the cowries of the south coast are like those of the Andamans, of Ceylon and Broome (i.e. Indian, not Pacific). The border between these two oceans, which follows the Malacca Strait over the mainland of Sumatra and Java, seems to be continued to Bali (and possibly to Timor). One would therefore expect to find further localities for *E. vredenburgi* on the south coasts of this chain of islands, where most of the specimens hitherto recorded have been obtained.

In this paper all particulars relating to the unique live-collected adult shell have been drawn up by R. P. Scase, in whose collection this specimen is at present. The details of measurements and distribution of the species as a whole have been furnished by Prof. Dr. F. A. Schilder.

*The first figure of each formula denotes the length in mm. and the second figure the breadth expressed as a percentage of the length. The third and fourth figures represent the hypothetical number of teeth for an arbitrary length of 25 mm., and the two letters at the end denote the closeness of the labial and columellar teeth respectively.

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STUDIES IN VARIATION OF COWRIES:
THE BASAL BLOTCHES OF *TALPARIA ARGUS*
(LINNAEUS)

By Dr. MARIA SCHILDER and Prof. Dr. F. A. SCHILDER

(Read before the Society, 19 October 1963)

In 180 adult and 13 not fully grown shells of *Talparia argus* (Linn.) from various localities the size of the four blackish brown blotches on the outer lip (A=anterior, B=posterior) and on the inner lip (C=anterior, D=posterior) has been classified in six degrees: 1=absent, 2=obsolete, 3=small, 4=rather large, 5=large, 6=unusually expanded. The frequency of these classes and the average size of each blotch may be illustrated by the following table:

Class	Adult shells							Young shells						
	1	2	3	4	5	6	mean	1	2	3	4	5	6	mean
A	10	8	29	67	50	16	4.0	4	3	3	3	—	—	2.4
B	17	25	50	43	30	15	3.5	10	2	1	—	—	—	1.3
C	—	—	1	21	106	52	5.2	—	1	2	6	4	—	4.0
D	—	—	—	16	108	56	5.2	—	1	2	6	2	2	4.1

The table shows, that (1) the blotches of young shells are much smaller than those of adult shells; (2) the labial blotches are distinctly smaller than the columellar ones; (3) the posterior labial blotch (B) is the smallest blotch in both adult and young shells, the sequence being B<A<C→D.

This general sequence, however, varies individually to some extent,

as the degree of correlation between the blotches is less than one would expect: though the average B is distinctly smaller than A, in many adult specimens the reverse is the case, as the following left-hand table shows: on the contrary, the right-hand table shows that the sum of the labial blotches (A + B) is very rarely larger than the sum of the columellar blotches (C + D).

A=	1	2	3	4	5	6	A+B=	2	3	4	5	6	7	8	9	10	11	12
B= 6	—	—	1	1	5	8	C+D= 12	—	—	1	1	—	3	4	4	4	7	5
5	—	1	1	6	15	7	11	—	—	2	2	5	10	4	16	5	4	3
4	—	2	7	14	19	1	10	1	1	5	5	9	24	13	6	8	1	—
3	3	1	5	32	9	—	9	2	1	3	2	4	2	3	—	—	—	—
2	2	2	8	11	2	—	8	1	2	2	1	—	3	—	—	—	—	—
1	5	2	7	3	—	—	7	1	—	—	—	—	—	—	—	—	—	—

The following mean figures indicate regional differences concerning the size of blotches:

Region	A	B	C	D	Sum (A+B+C+D)
Madagascar to Andaman Islands	3.6	3.2	5.2	5.1	17.1
West Sumatra and South Java	4.0	3.3	4.9	5.1	17.3
North Java to Aru and Philippines	4.0	3.2	5.1	5.3	17.6
Melanesia to Micronesia & Queensland	4.3	4.3	5.5	5.4	19.5

There seems to be a slight gradual increase in size of most blotches as well as of their sum from west to east in the Indopacific.

Similar basal blotches can be observed on the base of *Pustularia globulus* (Linn.) and *P. bistrinotata* Schilder & Schilder; a population of the latter, containing 74 shells from the Caroline Is. (Mus. Leiden), has been discussed in *Zoolog. Anzeiger* **85**: 133 (1929). We have distinguished four classes only, the value of which is, if compared with the present six classes of *argus*, about 1.0, 2.8, 4.0 and 5.2; the average size of the four corresponding blotches then is A=3.8, B=3.2, C=3.3, D=1.8, the sequence being D<B↔C<A in this population of *bistrinotata*, instead of B<A<C↔D in *argus*: there is a superficial similarity in markings, but the different sequences of their size point to genetical independence in the species of the two genera.

ON UNIO KENDALLI JACKSON, WITH DESCRIPTIONS OF THREE NEW SPECIES OF JURASSIC UNIONACEA

By F. R. WOODWARD

(Read before the Society, 18 May 1963)

Unio kendalli Jackson, 1911, from the Middle Jurassic, was described as follows:

External characters: Shell elongatedly oblong, tumid; anterior end moderately short, rounded; posterior end much produced, gradually decreasing in tumidity towards the gonium, above which the border is obliquely truncate; hinge-line fairly straight, about two-thirds the maximum length of the shell; basal-line curved. Gonial ridge

rather indistinct. Umbones prominent, not contiguous, placed well forward; umbonal region covered by a number of strong parallel and slightly wavy ridges, crossing the growth-lines obliquely. Lunule and ligament distinct. Growth-lines well-defined, in some specimens very pronounced.

Internal characters: Anterior adductor scar fairly deep and placed well forward; anterior pedal protractor scar small, situated posteriorly and ventrally to the above; anterior pedal retractor scar also small, occupying a position contiguous to the anterior adductor impression near its upper margin. Posterior adductor impression shallow and hardly noticeable on the cast. Pseudocardinal (i.e. antero-lateral) teeth and postero-lateral lamellae well-developed.

Dimensions: Length, $2\frac{7}{8}$ inches; height, $1\frac{1}{2}$ inches; thickness, $1\frac{1}{4}$ inches.

Geol. Horizon: Lower Estuarine Series, 27 feet above the Dogger.

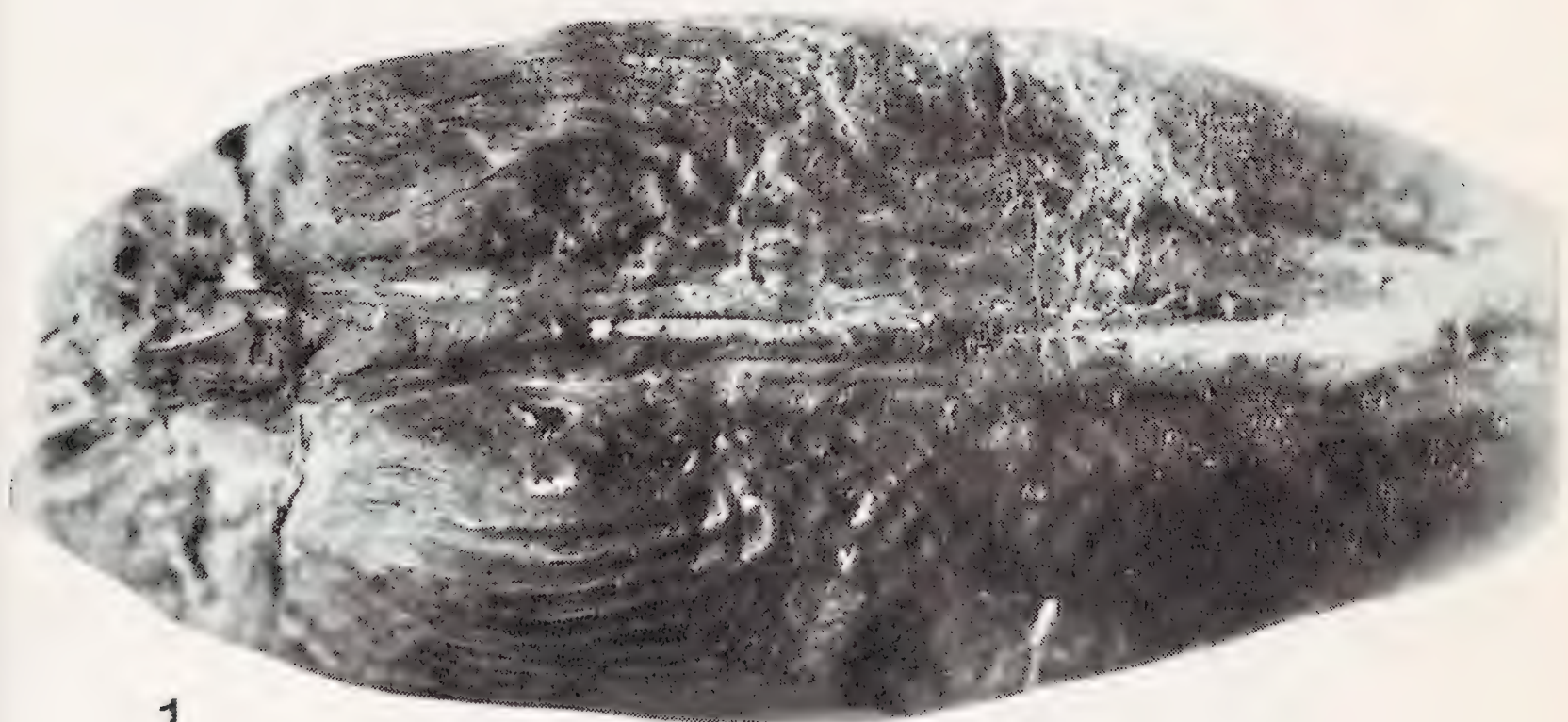
Locality: Saltwick, near Whitby, Yorks.

Jackson's excellent description is a composite one, based upon four syntypes together with further material now in the Geology Department, Manchester Museum. It has accordingly fallen to the author to select a lectotype for *Unio kendalli*. The four syntypes comprise three predominantly internal positive composite moulds, in various states of preservation, and one which appears to be an external cast, but is really an external positive composite mould. This last specimen is virtually complete, showing most of the external characters; it was figured by Jackson (1911, pl. 14, fig. 3), and is herewith selected as the lectotype of *Unio kendalli*. At some time before 1911 it was broken into three pieces, resulting in the loss of a small fragment from the central disc of the left valve.

	Lectotype	Dimensions (in millimetres)		
		Paralectotypes		
		A	B	C
Length: anterior-posterior	64.5	73	71	84
Height: dorsal-ventral	37	39	36	41
Thickness:				
Breadth of 2 valves + matrix	26	31	46	32
Width of matrix between valves	9	9	33	11

Remarks. Jackson describes the posterior margin as being "much produced, gradually decreasing in tumidity towards the gonium." Careful examination of the type material shows that in the majority of cases the posterior margin is truncated, resulting in the general outline being remarkably similar to that of *Margaritifera margaritifera* (L.), from which *U. kendalli* differs in its well developed umbonal sculpture. It is perhaps significant that the British fossil freshwater mussels of the Jurassic are mainly of a primitive *Margaritifera* type.

In the same paper Jackson refers to two other cases of fossil Unionids from the Lower Estuarine Beds, the first of which (consisting of two examples) was collected from Hayburn Wyke, together with plant remains, the most common of which was *Coniopteris hymenophylloides* (Brongniart). These specimens are in Manchester Museum, No. L.10505. Jackson has noted on the label that they may be the young of *Unio kendalli* or of *U. phillipsi* (?). Careful examination of these Hayburn Wyke shells shows that this is not so, since *U. kendalli* is characterised by well developed umbonal sculpture, which is absent



1



2

UNIO KENDALLI JACKSON
1. *Lectotype*. 2. *Paralectotype*.

[To face p. 236

in the case of these shells. Moreover, the outline of these fossils differs considerably from that of juvenile *U. kendalli*.

The other set referred to, comprising four specimens, was obtained from the Lower Estuarine series at Brow Alum quarries on the south side of Robin Hood's Bay by Professor Kendall and J. W. Jackson in the same year (1911). These also prove to be distinct from *U. kendalli*. Enquiry has failed to bring to light further examples, but these are being described as new species in the hope that workers with access to the area may obtain further material.

Anodonta (?) biltoni *sp. nov.*

?*Unio insperatus* Phillips, 1875, *Geology of Yorkshire* (nom. nud.).

Unio sp. Jackson, 1911, 211; 1952, 78.

Description. Shell equivalve, inequilateral, relatively thin, inflated, elongate-oval in outline, the height being approximately three-fourths of the length. Umbones situated one-third of the way along the length of the shell. Anterior margin produced slightly, rounded, meeting the ventral margin, which is markedly convex. Posterior margin roundly truncated, hingeline straight, alate posterior to the umbones. There is no trace of the ligament. On examining the umbonal region under a hand lens, sculpturing in the form of raised concentric rugae, running parallel to the distinctly marked growth lines, can be discerned. Interior morphology unknown.

Dimensions. Length 14.5mm., height 10.5mm., thickness (single valve) 2.5mm.

Geological Horizon. Lower Estuarine Series, in association with *Coniopterus hymenophylloides*.

Remarks. The unique type specimen was collected by J. W. Jackson at Hayburn Wyke in 1911. Unfortunately the hinge-plate is hidden, but in general outline there is a marked resemblance to young shells of *Anodonta cygnea* (L.), hence this species is provisionally placed in the genus *Anodonta* sensu lato. I have great pleasure in naming this species after Mr. L. Bilton, Keeper of Natural History, Birmingham Museum, in recognition of his considerable help and encouragement over the last ten years. The type specimen is in the Geological collection of Manchester Museum.

Unio jacksoni *sp. nov.*

Unio sp. Jackson, 1911; 1952, 78.

Description. Shell inequilateral, tumid, umbones prominent, situated two-sevenths of the way along the shell. Dorsal margin produced anterior to the umbones and continuing into the curved anterior margin. Ventral margin relatively straight and parallel to the dorsal margin, in old individuals tending to have a median sinuosity. Posterior margin obliquely rounded, dorsal margin straight, ligament fairly long, external growth lines raised and distinct. No umbonal sculpture visible, possibly due to the poor state of preservation. The type specimen, in the form of a predominantly internal positive composite mould, shows evidence of well developed lateral teeth and pseudo-cardinals, hence the species is placed in the genus *Unio* sensu lato.

Dimensions (in millimetres)

				Holotype	Paratypes	
					A	B
Length	..	..	..	43.25	40	49.5
Height	..	..	..	21.5	18	26
Thickness	..	..	..	20	7 (1 valve)	6 (1 valve)

The width of matrix between the ventral margins of the valves of the holotype is 12.75mm. The third paratype is too fragmentary to measure.

Geological Horizon. Lower Estuarine Series, 18 inches above the Dogger, Brow Alum quarries, near Peak, Robin Hood's Bay, Yorkshire. Jackson states that the *Unio* bed lies just beneath a seat-earth with rootlets, on top of which is a very impure coal seam.

Remarks. The specimen referred to by Jackson as having been found by the Rev. B. C. Constable may be the fragmentary example, which is unregistered. The three strong lirae mentioned as occurring on the posterior slope of one specimen are caused by post-preservational movements. These fossils would appear to be the oldest authoritative examples of *Unio* in the British Isles. I have much pleasure in naming them after Dr. J. W. Jackson, in recognition of his contributions to studies on fossil Unionacea. The material is in Manchester Museum.

***Unio eagari* sp. nov.**

Unio sp. Jackson, 1911; 1952, 78.

Description. Shell equivalve, strongly inequilateral, umbones elevated, situated approximately one-fourth of the way along the length of the shell. Anterior margin produced, rounded; ventral margin relatively straight and tending to be parallel to the dorsal margin. Posterior margin truncated. Growth lines well marked. No trace of ligament. The umbonal sculpture appears to be in the form of simple rugae running parallel to the growth lines and there is also evidence of an apparent disc sculpture, but this may be the result of wrinkling of the periostracum after the death of the animal. Internal structure unknown.

Dimensions. Length 20.5mm., height 9mm., breadth (1 valve) c. 2.5mm.

Geological Horizon. Lower Estuarine Series, in association with *Coniopterus hymenophylloides*.

Remarks. The unique type specimen in general outline is highly reminiscent of *M. margaritifera*. This species is named after Dr. R. M. C. Eagar, in appreciation of his great help in lending material and in giving valuable comments and advice. The type specimen is in the Geology Department, Manchester Museum.

Summary

Three new species of Middle Jurassic freshwater Unionacea are described: *Anodonta biltoni*, *Unio jacksoni* and *U. eagari*. A lectotype is designated for *Unio kendalli* Jackson.



1. *Unio eagari*. 2, 3. *Unio jacksoni*. 4. *Anodonta biltoni*.

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Acknowledgements

The author wishes to express his thanks to Dr. R. M. C. Eagar for the loan of material, to Mr. R. F. Cumberland for photographs of the three new species, to Mr. W. Belsher for photographs of *Unio kendalli*, and to Mr. L. Bilton, Mr. T. E. Crowley and Mr. T. Pain for helpful criticism and advice.

Addendum

Since this paper was read, J. D. Hudson (1963, *Palaeontology*, **6**: 345, pl. 53, figs. 1, 2, text-figure 3) has published a description of *Unio andersoni*, from the Lower Ostrea Beds (?), Great Estuarine Series (Bathonian), Middle Jurassic, Isle of Skye. This appears to be related to *Unio eagari*.

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EXPLANATION OF PLATES

- Plate 15. *Unio kendalli* Jackson. Figure 1, lectotype. Figure 2, paralectotype. Photographs by W. Belsher.
 Plate 16. Figure 1, *Unio eagari* Woodward. Figures 2 and 3, *Unio jacksoni* Woodward. Figure 4, *Anodonta biltoni* Woodward. Photographs by R. F. Cumberland.

ZONITOIDES ARBOREUS (SAY) (ZONITIDAE) IN KENYA

By B. VERDCOURT

(Read before the Society, 19 October 1963)

Records of Mollusca introduced into Tropical Africa are few and far between, so it seems important to register such records in case the animal spreads; this does give a rough indication of the date of introduction. In May 1963 Mrs. E. J. Brown sent me several hundred small Zonitids which she had found around the doorways of a house at Karen, an outlying residential district to the south-west of Nairobi. These were a small portion only of a large population consisting of many thousands of these snails. My determination of these as *Zonitoides arboreus* (Say) was kindly confirmed by Dr. Lothar Forcart, who reported that the genitalia exactly matched the figure given by Pilsbry (1946, 479). The main bulk of the material is being deposited in the British Museum (Natural History). How the snails were introduced is unknown, but the house does belong to someone working at an international airport.

Since I reported the occurrence of *Agriolimax laevis* (Müller) (Verdcourt, 1960), I have seen specimens from Ruiru, about 12 miles north-east of Nairobi, collected by T. J. Crowe, and from Muguga, 18 miles north-west of Nairobi, collected by M. D. Gwynne.

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AN ABNORMAL CHITON

By K. H. BARNARD

(Read before the Society, 16 November 1963)

A rather peculiar example of *Chaetopleura pertusa* (Reeve) was found by Mrs. Connolly during a recent visit to Queensberry Bay, East London. The specimen is nicely preserved, stretched out flat, measuring overall 30×16 mm.; the visible shell measures 26×9 mm. The head and tail valves, and the 3rd, 4th and 7th valves are grey; the 2nd valve is brick-red; the left half of the 5th, and the right half of the 6th valve are grey, the opposite halves red. There is also a small triangular red patch in the middle of the right-hand anterior margin of the 4th valve. On the tail valve is a small white gusset from umbo to hind margin. The sculpture on the grey valves and the grey portions of the "two-tone" valves is normal, typical *pertusa*, the ridges on the dorsal area being close together, with numerous granules which produce a beaded appearance, with a series of pits between each pair of ridges. The sculpture on the red portions is simplified. The lateral areas have 4 or 5 feeble radiating ridges, each with 3–6 tiny granules; the dorsal areas have about 14 fine radiating ridges on the all-red 2nd valve, 7–8 on the half-red valves, each with a few (6 at most) tiny granules. Much more of the smooth surface of the valve is visible in the red portions than on the valves with normal sculpture; and the smooth pleural area (i.e. the outer part of the dorsal area in front of the lateral area) is particularly noticeable.

The South African Museum has some beach-worn valves from Port Alfred which were presumably red in life, but are now faded to an orange-red; they show the normal sculpture. It has also a specimen from False Bay, the valves of which are now dull pinkish but which appear to have been unicolorous; parts of some of the valves show a tendency to reduction of the number of ridges, and the number of granules on them; the pits also tend to be suppressed, so that the spaces between the ridges are smooth. But these areas are not sharply demarcated from the areas with normal sculpture.

In the East London specimen some physiological upset in some of the shell-secreting cells, operating from the first formation of the shell, has affected simultaneously and in certain circumscribed areas both the sculpture and the pigmentation. If an isolated valve covered wholly with the simplified sculpture, as on the 2nd valve of the present specimen, were found it would probably be regarded as belonging to a different, perhaps undescribed, species. It is therefore a warning that no description of a supposedly new Chiton should be based on only a single valve.

Perhaps members of the Conchological Society will look-out for similar abnormalities. Specimens with patches of a different colour, especially asymmetrical patches, should be closely examined.

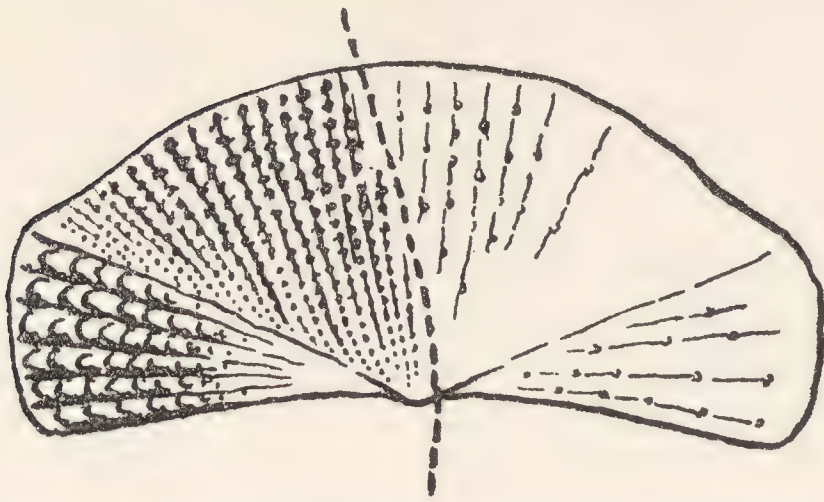


Fig. 1. *Chaetopleura pertusa* (Reeve): 5th valve of abnormal specimen. The area to the left of the pecked line is grey with normal sculpture, that to the right is red with simplified sculpture.

A COLLECTION OF SHELLS FROM PESARO, ITALY

By ROBERT RENDALL

(Read before the Society, 14 December 1963)

A catalogue of species from one restricted locality has some value as a distributional check-point. The following list of Mollusca, collected during seven visits to Pesaro on the Adriatic coast of Italy, from 1950 to 1963, may therefore not be without interest. The list comprises 38 species, to which can be added from Mr. T. E. Crowley's supplementary list one other record from Pesaro and four more from nearby localities. With the exception of *Cassidaria tyrrhena* and *Pecten jacobaeus*, which were obtained in the local fish market, all the shells were collected from drift between tidemarks on a mile-long stretch of sandy beach southward from the harbour. The presence of some land shells among the drift may be partly accounted for by the proximity of gardens along the seafront, but is more probably due to the use by fishermen of evergreens in their creels.

I am most grateful to the Rev. H. E. J. Biggs and Mr. T. E. Crowley for identifying the species, and to Mr. S. P. Dance and Mr. D. Heppell for valuable assistance with the nomenclature.

Bivalvia

- Glycymeris violacescens* (Lamarck)
- Anomia ephippium* L.
- Mytilus edulis* L.
- Crassostrea angulata* (Lamarck)
- Chlamys glabra* (L.), *C. varia* (L.), *C. tigerina* (Müller)
- Pecten jacobaeus* (L.)
- Phacoides borealis* (L.)
- Loripes lucinalis* (Lamarck)
- Cardium* (*Acanthocardia*) *paucicostatum* Sowerby, *C. (A.) tuberculatum* L.
- Chamelea gallina* (L.)
- Petricola lithophaga* (Retzius)
- Mactra stultorum* (L.)
- Donax trunculus* L. var. *adriatica* (Monterosato)
- Tellina squalida* Pulteney, *T. exigua* Poli, *T. nitida* Poli
- Pharus legumen* (L.)

Ensis siliqua (L.)
Pholas dactylus L.
Barnea candida (L.)

Gastropoda

Patella (Patellastra) lusitanica Gmelin
Turitella communis Risso
Clathrus turtonis (Turton)
Aporrhais pespelecani (L.)
Natica millepunctata Lamarck
Cassidaria tyrrhena (Gmelin)
Nassarius mutabilis (L.), *N. reticulatus* (L.)
Acteon tornatilis (L.)
Philine aperta (L.)

Cephalopoda

Sepia officinalis L.

Land Shells

Pomatias elegans (Müller)
Helicella virgata (da Costa)
Helix aspersa L.
Oxychilus draparnaldi (Beck)

Supplementary List from T. E. Crowley

Ancona
Pecten jacobaeus (L.)
Littorina neritoides (L.)
Natica millepunctata Lamarck
Cassidaria tyrrhena (Gmelin)
Nassarius mutabilis (L.)
Manfredonia
Donax trunculus var. *adriatica* (Monterosato)
Pesaro
Corbula mediterranea O. G. Costa
Porto Venere
Gibbula (Colliculus) adansonii (Payraudeau)
Gibbula (Phorcus) richardi (Payraudeau)
Nassarius costulatus (Brocchi)

ICELANDIC LAND AND FRESHWATER MOLLUSCA

By J. ARMITAGE and N. F. McMILLAN

(Read before the Society, 18 January 1963)

During World War II one of us (J.A.) was stationed in south-west Iceland from July until September 1942 and was able to do a good deal of collecting during this period. No details of this material have been published, so that when N. F. McM. visited Iceland in July 1962 and also found some interesting species, it was thought that a joint account of our findings might be acceptable. Of the localities listed

Akureyri and Lake Myvatn are in the north of the island, and the rest are in south-west Iceland. Quarageri is in a hot-spring region and a slope above was dotted with steaming vents and springs; hot water from some of these was piped through hot-houses. Tuxen (1944) has given an account of Icelandic hot springs and their fauna, and more recently Starmühlner (1957) studied the anatomical differences of *Lymnaea peregra* living in various thermal conditions in Iceland, and also discussed the various environmental factors influencing the biology of the species.

Lymnaea truncatula (Müller). By hot sulphur stream, Quarageri (J.A.).

L. palustris (Müller). Edge of marsh, Kaldadarnes, 18/vii/1942 (J.A.); a dwarfed form only 8mm. high. It was at first thought that these might belong to the closely allied species *L. vahli* Möller of Greenland, but they do not agree with the figures of that species given by Soós and Schlesch (1926) and by Hubendick (1951, fig. 328), and appear typical *palustris* in every way except size.

L. peregra (Müller). The species (as *L. ovata* Drap.) is recorded by Mandahl-Barth (1938) as generally distributed in Iceland. It was taken at Kaldadarnes, in a drain and a pool (J.A.); in Tjornin, Reykjavik; L. Myvatn; and in ditches near Eyrarbakki and at Akureyri (N.F.McM.). All the shells were very thin and fragile. The Myvatn shells measured up to 19mm. high, and those from Tjornin up to 22mm. high. Var. *picta* Jeffreys: specimens from a warm rivulet (temp. 55°F.) below a hothouse at Quarageri (J.A.).

Planorbis spirorbis (L.). Pond at Kaldadarnes (J.A.). Ditch at Eyrarbakki, a few specimens (N.F.McM.). Mr. Stelfox, who has seen the specimens from both these localities, remarks that they are very much more like what Kennard used to call "true *spirorbis*" rather than our *leucostoma*, and this agrees with the known Icelandic distribution of the two forms (Mandahl-Barth 1938).

Succinea groenlandica (Möller). Eyrarbakki, under logs; Kaldadarnes, in a cold marsh; and Quarageri, at the edges of warm streams (J.A.). At the last-named locality the mollusks lived on steaming moss within inches of scalding sulphur-water. Mr. Stelfox notes that these Icelandic specimens are, in shell-characters, very like *S. pfeifferi* taken by him at Loch Skail, Orkney. *S. groenlandica* has been examined anatomically by Dr. H. E. Quick, who considers it hardly different from *S. pfeifferi*.

Cochlicopa lubrica (Müller). Kaldadarnes and Quarageri, under moss (J.A.); Thingvellir, at waterfall (N.F.McM.). All are the true *C. lubrica*, and not *C. lubricella* (Stabile).

Vertigo arctica Wallenberg. Quarageri, scarce, on a damp stony slope (J.A.).

Arion circumscriptus Johnston. Near Akureyri, under old plank, one specimen (det. Quick), (N.F.McM.); ? introduced.

A. ater (L.). Quarageri, a few and a batch of eggs, 22/viii/1942 (J.A.).

Euconulus fulvus (Müller). By the river Olfusa, Kaldadarnes and Quarageri (J.A.).

Vitrea crystallina (Müller). Quarageri, in moss on a damp bank (J.A.).
Oxychilus alliarius (Miller). Quarageri and Kaldadarnes, a few (J.A.).
Retinella hammonis (Ström) (*radiatula* Alder). Thingvellir, waterfall by road, one (N.F.McM.).

R. pura (Alder). Quarageri, one in moss (J.A.).

Zonitoides nitidus (Müller). Quarageri, one immature specimen at the edge of a warm stream (J.A.).

Vitrina pellucida angelicae Beck. By the river Olfusa, Kaldadarnes, under stones and among moss (J.A.). Recently dead specimens abundant beside a slightly brackish lagoon at Bessastadir (N.F.McM.).

Limax maximus L. or *L. cinereoniger* Wolf. One specimen, too young to determine specifically, was taken in a little public park at Hafnarfjordur (N.F.McM.). Dr. Quick remarks "perhaps more likely the latter".

Agriolimax reticulatus (Müller). Kaldadarnes, in litter (J.A.).

Pisidium casertanum (Poli). Kaldadarnes, magnificent specimens in a pond (J.A.). Ditch near Eyrarbakki and a ditch near Akureyri (N.F.McM.). All det. Stelfox.

Of the Mollusca listed above no fewer than four species have not hitherto been recorded from Iceland, viz. *Lymnaea palustris*, *Retinella pura*, *Zonitoides nitidus* and *Limax* sp. The *Limax* sp. (either *maximus* or *cinereoniger*) is almost certainly an introduction, as its occurrence in a public park strongly suggests. There seems, however, no reason to doubt that *L. palustris* is truly native; such dwarfed specimens could be passed as *L. truncatula* quite easily until the rounded, not shouldered, whorls are noted. *L. palustris* is a Holarctic species but has not been recorded from Faeroe.

The case for *Retinella pura* and *Zonitoides nitidus* is less convincing. Only one example of each species was obtained, and there are hot-houses close by where tomatoes and other exotic plants are grown, so that introduction is a probability.

We are grateful to Dr. H. E. Quick and Mr. A. W. Stelfox for determinations of slugs and *Pisidium* and for helpful comments.

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AN ISLAND FAUNA (HILBRE, CHESHIRE)

By NORA F. MCMILLAN

(Read before the Society, 18 January 1964)

The trio of islands known as Hilbre, Middle Hilbre, and The Eye lie off the mouth of the River Dee, and are islands for only part of each tide. At low water more than a mile of wet sand, interspersed by shallow gutters, separates them from the mainland. Nevertheless nineteen species of Mollusca have been obtained on them, eighteen on Hilbre and one on Middle Hilbre. In addition three species have been recorded from Hilbre but not refound, and a kitchen-midden yielded yet another species. The three islands are in area $11\frac{1}{2}$ acres (Hilbre), 3 acres (Middle Hilbre) and $\frac{1}{2}$ acre (The Eye). All are exposed and windswept; the rock is the inhospitable Bunter Sandstone (Triassic). The absence of grazing animals encourages the flora, but there are no trees nor shrubs except one or two stunted sycamores in gardens. The only water was a small artificial pond which went dry suddenly and permanently after a stick of bombs fell nearby; the bottom is still moist but holds no snails now.

Hilbre has a number of holiday bungalows and huts on it and the Keeper's house (occupied); there are a few very derelict gardens, the last of which went out of cultivation about 1950. Middle Hilbre shows traces of former cultivation on the east side where there are small square enclosures surrounded by low banks, but the only information I have been able to obtain about these is that all cultivation on Middle Hilbre had already been abandoned in 1890. It has been suggested that these enclosures are Roman work, and Roman remains have been found in peat formerly exposed at The Eye (Shone 1885). Newstead (1927) also found a kitchen-midden on The Eye. Erosion on the western side of Hilbre in 1939 revealed another kitchen-midden (McMillan 1943) containing *Helix nemoralis*, which does not now live on the islands. The Eye had a wartime post on it and is now derelict with a pitiful flora struggling for existence on the trampled clay which overlies the sandstone.

LIST OF SPECIES OBTAINED

Lymnaea stagnalis (L.). Until September 1941 the pond held small specimens.

L. peregra (Müller). Also in the pond until September 1941.

Cochlicopa lubricella (Stabile). Most of the specimens had white shells and normally coloured bodies. In August 1959 twelve white shells and one horn-coloured were taken.

Lauria cylindracea (da Costa). Middle Hilbre, March 1957, one living specimen and a shell under *Silene maritima* Withering.

Helix aspersa (Müller). Common.

Hygromia striolata (C. Pfeiffer). Three fresh shells in Dr. Macafee's garden, October 1956. This species is inexplicably rare in Cheshire, the only other records being that of Bellars from Chester

(1858) and the Storeton Woods colony (see *Proc. Liverp. Nat. Field Club* for 1957, p. 26).

Discus rotundatus (Müller). One, October 1951.

Arion intermedius Normand. Several, October 1956.

A. circumscriptus Johnston. Several, 1956.

A. hortensis Férussac. One, October 1956, another October 1960.

Oxychilus draparnaldi (Beck). One living specimen and several shells. October 1956. Several more between 1957 and 1959. One under *Silene maritima* at edge of cliff on the east side of the island, August 1959.

O. cellarius (Müller). Occasional.

O. alliarius (Miller). Not uncommon.

Retinella nitidula (Draparnaud). One, October 1956, and six small specimens, July 1958. Two shells, April 1957.

Vitrina pellucida (Müller). Fairly frequent among nettles, October 1956.

Milax gagates (Draparnaud). One, July 1956. Var. *rava* Williams, one specimen, October 1956. Both *det.* H. E. Quick.

M. sowerbyi (Férussac). Two adults and several young, October 1956. Young specimens in garden, August 1959, and several young close to former pond. All *det.* H. E. Quick.

Agriolimax reticulatus (Müller). Large vividly coloured specimens in Dr. Macafee's derelict garden, October 1956; mostly cream-coloured with chocolate or black marblings. All *det.* H. E. Quick

The three unverified species are:

Vallonia costata (Müller). Recorded by Byerley (1854) and quite possibly still there.

Pyramidula rupestris (Draparnaud). A boxful of specimens marked "Hilbre Ches. J. Ray Hardy" in the Jackson-Standen Collection, Liverpool Museums. The species may occur on Hilbre but as Hardy was not always reliable in his localities the record must await confirmation.

Helicella virgata (da Costa). There is an old record for Hilbre—Gregson in Marrat (1863). Oldham (1896) notes that he failed to refind it in 1894.

To the above list should be added:

Helix nemoralis L. Shells in kitchen-midden of unknown age (McMillan 1943).

The interest of the molluscan fauna of Hilbre lies in the group of "garden" species (*Oxychilus draparnaldi*, *Hygromia striolata*, *Milax gagates* and *M. sowerbyi*) maintaining themselves in a most unlikely habitat (the gardens are very small and the mollusks not confined to them). Of the other species found, *Helix aspersa*, *Arion circumscriptus* and *A. hortensis*, although common in gardens, are not confined to them.

A similar though much smaller tidal island (the island, Green-island, Co. Antrim—in Belfast Lough, Northern Ireland) yielded seven species of land-shells (McMillan 1960), none of them "garden" species, and including *Clausilia bidentata* (Ström) and *Vallonia excentrica* Sterki, both of which might be expected to occur on Hilbre but which, in fact, have not been found.

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REVIEWS

Marine molluscan genera of western North America. An illustrated key. A. MYRA KEEN, with the assistance of EUGENE COAN. Pp. 126, 447 text figures. Stanford University Press, California; Oxford University Press, London. 1963. Price 36s. net.

This illustrated key is based on two previous publications, namely *Illustrated key to west North American Pelecypod genera*, by A. M. Keen & D. L. Frizzell (1939) and *Illustrated key to west North American Gastropod genera*, by A. M. Keen & J. C. Pearson (1952). This new book also includes the orders Amphineura, Scaphopoda and Cephalopoda. The key itself, which is based on shell characters only, is easy to follow, and the standard of illustration is high. Apertural aspects of Gastropod shells are shown wherever possible, and details of the hinges of Bivalves are depicted with creditable clarity. The section on Chitons is illustrated with excellent detail, but it is difficult to see why the section on Cephalopods was included, as this is the least satisfactory. It is true that the term "shell" is given in inverted commas, but the figures include *Argonauta*, which is really a calcareous brood pouch, and beaks or mandibles, which cannot conceivably be regarded as shells. Moreover, cuttle "bones," which can be homologised with shells, are omitted. Is this because *Sepia* does not occur off the west coast of North America? Even so, they could have been included, with a note to this effect.

The key is followed by a systematic list. A useful addition for the beginner is an English translation of the group names. The section on ecology gives the approximate number of species in each genus, the range of the genus along the west coast of North America and a brief indication of its ecologic niche, i.e. where it lives. There is a glossary of technical terms, a short bibliography and a complete index. One of the merits of this most useful book is that each figure is on the same page as the genus which it illustrates in the key.

L. W. STRATTON

A Glossary of Cornish Sea-words. R. MORTON NANCE, edited by P. A. S. POOL. Pp. 204, 7 plates. The Federation of Old Cornwall Societies, 1963. Price 25s., obtainable from Mr. L. R. Moir, Pengarth, Carbis Bay, St. Ives, Cornwall.

This work, which was virtually completed in 1920, is now published as a memorial to the author, the second Grand Bard of Cornwall, who was celebrated for his paintings, drawings and models of sailing ships, of which he acquired an expert knowledge, and for his enthusiasm for all things Cornish, particularly the ancient language. The entries referring to natural history have been checked by Dr. F. A. Turk, who has revised the scientific nomenclature. The following are Cornish words for various kinds of Mollusca.

Pinna: askal, askel, capa longa, caper-longer; *Teredo*: auger-fish; *Mytilus*: bezlen, mesclen; *Ensis*: cleg, clig, keligen, kilygan, kalega; *Ostrea*: estren; *Chlamys*: queen, quin, scollop; *Trivia*: blackamoor's teeth, guinea-pigs, moneypennies; *Patella*: brennygen, crogen, croggan, davas lagas, lempot; *Littorina*: gweean, gweggan, norman, wrinkle; *Sepia* (or cuttlebone): boot, coal-fish, cole, coodle, cuddle, goil, goyle, padelynkyn (and variants), stifak (and variants), sea-shore, shegee, taghir, honeycomb, gear, skuttle-bone; *Octopus*: goluzzow, guzalezza, jackass. Cussy means either mussels or cowries, and trig or treag shellfish.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

**807th Meeting, held at the British Museum (Natural History),
19 October 1963**

The President, Mr. L. W. Stratton, in the chair.

Communications

"Studies in variation of cowries: the basal blotches of *Talparia argus* (L.)," by M. & F. A. Schilder.

"*Zonitoides arboreus* (Say) in Kenya," by B. Verdcourt.

Exhibits

Special exhibit: Viviparidae, introduced by Mr. T. Pain; examples were also exhibited by the President, by Mr. C. P. Castell (from the collections in the British Museum) and by Mr. D. G. Pickrell.

Mr. C. P. Castell: living *Limax cinereo-niger* Wolf from Bookham Common, Surrey.

Mr. L. C. Prebble: shells sent from New Zealand by Mr. H. Tibble and Mrs. L. Smith, including *Astraea heliotropium* exposed at low tide at French Pass; *Placostylus ambagiosus* s.sp. *spiritus* and *priscus*, fossil, Van Dieman's Point, Cape Marie; *Paryphanta hochstetteri obscura*, D'Urville Island (now being exterminated by wild pigs); *P. busbyi*, Hukeriniui; *P. lignaria lusca*, Glass Eye Creek, Karamea; *P. traversi otakio*, Otaki; and snails introduced from Jamaica with bananas, from Messrs. Fyffe's warehouses, Newport, Isle of Wight.

Mr. R. P. Scase: *Afrivoluta pringlei* Tomlin, trawled in 60 fathoms off Port Elizabeth, South Africa, with *Marginella bullata* Born for

comparison (see *J. Conch.* **25**: 198); 16 species of *Latiaxis*, including *L. gyratus* Wood, Formosa; *L. kawamurai* Kira and *L. kinoshitai* Fulton, Tosa Bay, Kochi Prefecture, Japan; *L. stenospinus* Kuroda, Kii Strait, Japan; *L. tosanus* Hirase, Kochi Pref., Japan.

**808th Meeting, held at the British Museum (Natural History),
16 November 1963**

The President, Mr. L. W. Stratton, in the chair.

Members Elected

Mrs. H. P. V. Bailey, B.A., P.O. Box 1120, Mombasa, Kenya.

Jeremy Henry Benson, Walpole House, Chiswick Mall, London, W.4.

Miss Zoé E. Brown, Bracken, Plantation Road, Leighton Buzzard, Beds.

Jack Harben Cameron, Commonwealth Banking Corporation, Mendana Avenue, P.O. Box 75, Honiara, Guadalcanal, B.S.I.P.

Miss Marjory Garnett, Hill Garth, Seascale, Cumberland.

Supply Sub Lieut. Neil Henderson, R.A.N., H.M.A.S. *Tarangau*, Lombrum, New Guinea.

David Knight, 2 Riverside Villas, Portsmouth Road, Surbiton, Surrey.

George Bryan Mitchell, M.B.E., M.A., Rockdene, Lymington Road, New Milton, Hampshire, and c/o Ministry of Lands, Forests and Wild Life, P.O. Box 9134, Dar es Salaam, Tanganyika.

Mrs. Mary Jane Mitchell (ditto).

Natal Museum, Loop Street, Pietermaritzburg, Natal, South Africa.

Jonathan G. Parsons, Warwicks, Roxwell, Chelmsford, Essex.

James McKenzie Sloss, Leisureland, West Rosebud, Victoria, Australia.

Gregory Noel Smith, Linden Lea, Scotlands Drive, Farnham Common, Bucks.

Miss Gillian Spicer, West Wing, St. Katherine's College, White Hart Lane, Tottenham, London, N.17.

Communications

"An abnormal Chiton," by R. K. Barnard.

"New observations on *Erronea vredenburgi* Schilder (Cypraeidae)," by R. P. Scase & F. A. Schilder.

Dr. Lloyd V. Knutsen, of Cornell University, delivered a lecture on "Flies predatory on snails," illustrated by colour transparencies.

Exhibits

Special exhibit: *Helicella*, introduced by Mr. C. P. Castell; examples were also shown by the President and the Rev. H. E. J. Biggs.

Mrs. M. Mitchell: Cowries collected alive at Dar es Salaam.

Dr. J. O'N. Millott: a selection of non-marine Gastropoda from his collection, including *Lymnaea peregra involuta* from Loch Fleodach, Sutherlandshire, which when mated with a normal *peregra* gave large numbers of involute offspring, and *L. glutinosa* from Lake Bala, where it now seems to have died out.

Mr. T. Pain: Mollusca of swift streams in British Guiana and Surinam.

Mr. R. P. Scase: *Conus (Asprella) comatosa* Pilsbry, Formosa, and *C. (Chelyconus) kinoshitai* Kuroda, Tosa Bay, Japan, both very rare.

Mrs. S. M. Turk: living examples of 3 species of *Patella* from Cornwall.

Mrs. N. F. McMillan: 1. Large single sheet entitled "Synopsis of the Lamarckian genera of shells, with the Linnaean synonyms, and the number of ascertained species," printed by Benson, Weymouth (no date); the number of species is 5308. 2. An 8-page booklet entitled *Unique Novelties and Curios* (no date, but thought to be 1920-30), the title is followed by a "poem" of quatrains, then the following: "Visitors seeking Novelties are invited to pay a visit of inspection. The stock comprises every known Specimen of Sea-Shell. Collectors wants studied. Ask for any Shell required, as many are not shown. All Enquiries to Mrs. E. S. Jones, Sea Shells, Porthcawl, Glam." Printed by Sims, Porthcawl.

809th Meeting, held at the British Museum (Natural History), 14 December 1963

The Rev. H. E. J. Biggs, vice-president, in the chair.

Member Deceased

The chairman announced the death of Dr. Frank Fortescue Laidlaw.

Members Elected

Ronald J. Boscott, Ph.D., B.Sc., Sunnycroft, 14 Southwall Road, Deal, Kent.

Robert Miles Carter, 140 Crofton Road, Orpington, Kent.

Walter O. Cernohorsky, Emperor Gold Mining Co. Ltd., Vatukoula, Fiji.

Mrs. Aylmer Clarke, 18 Lodge Road, Coleraine, Co. Derry, Northern Ireland.

E. G. Ing, N.D.H., 19 Laity Road, Troon, Camborne, Cornwall.

Mrs. Betty M. Smith, Eastview, Birdham, Chichester, West Sussex.

Communication

"A collection of shells from Pesaro, Italy", by Robert Rendall.

Exhibits

Special exhibit: *Limicolaria*, introduced by Mr. T. E. Crowley; examples were also shown by the Rev. H. E. J. Biggs and Mr. T. Pain.

Mr. C. P. Castell: a Museum exhibit illustrating the evolution of *Viviparus* in the Pliocene (see Neumayr & Paul, 1875, *Die Congerien- und Paludinenschichten Slavoniens*, *Abh. K. K. Geol. Reich.* **7**, Hft. 3, plate 4). Mr. R. Fresco-Corbu: *A year at the shore*, by Henry Gosse, 1865. Mrs. Mary Mitchell: a shell of *Macrocypraea cervus* with an attached acorn barnacle covered by nacre.

810th Meeting, held at the British Museum (Natural History), 18 January 1964

The President, Mr. L. W. Stratton, in the chair.

Members Elected

Dr. R. L. Markham, c/o Miss Z. V. Cobham, 97 Canfield Gardens, London, N.W.6 (temporary address).

Mrs. A. E. Moore, 5 Harrington Road, South Kensington, London, S.W.7.

Roderic Stavers Oloman, Flat 3, 3 Manson Terrace, Lossiemouth, Morayshire.

Dennis Pallant, B.Sc., M.I. Biol., 4 Willow Grove, Beverley, Yorkshire.

Communications

"Notes on British Tertiary freshwater mussels, with descriptions of three new species," by F. R. Woodward.

"An island fauna (Hilbre, Cheshire)," by Mrs. N. F. McMillan.

"Icelandic land and freshwater Mollusca," by J. Armitage and Mrs. N. F. McMillan.

Exhibits

Special exhibit: Chitons, introduced by Mr. S. P. Dance; examples were also shown by the President, Rev. H. E. Biggs, Mr. C. P. Castell, Dr. R. L. Markham and Mr. R. P. Scase.

Major P. K. Earle: *Macra glauca* var. *luteola* Jeffreys from Hayle, Cornwall, collected by Williams Hockin, c. 1860, and Miss P. J. White, 1961 (from the County Museum, Truro).

Mr. T. Pain: *Burtoa nilotica* Pfeiffer from Tanganyika and Kampala, and *Limicolaria martensiana* Smith from Kampala, Uganda.

Mr. F. R. Woodward: specimens to illustrate his paper.

Film

Dr. S. Markowski exhibited a colour film on "Biological investigations at Roosecote Power Station."

THE DISCOVERY OF TWO SPECIMENS OF *CONUS GLORIAMARIS* CHEMNITZ IN RABAU, NEW BRITAIN

BY CYRIL E. HOLLAND, F.Z.S.

Two shells of *Conus gloriamaris* came into the public news in October 1963 in Rabaul, New Britain. One of these was discovered by Mrs. Anne Appleton, a local resident, and the other by Mr. George Edwards, a plantation manager on the Duke of York Islands, twenty miles east of Rabaul. [An article on these finds, with photographs of the two shells, appeared in *The Illustrated London News*, 30 November 1963, p. 912.]

The Appleton find was made at Praed Point on the outskirts of Rabaul, possibly on the beach, which consists of black sand (pumice and perhaps ilmenite). The beach is at the foot of a low volcano (Matupi). The sea at this point is often at an abnormally high temperature. Mrs. Appleton is not sure exactly where and when the shell was picked up, but it was in September 1963. As an amateur collector, she gathers shells on the beaches, in the shallow waters and on the reefs, and cleans and sorts them when convenient. The shell was noticed while cleaning a bucket-full at home. It is a dead shell, measuring approximately $3\frac{3}{8}$ inches, and is free from noticeable defects.

The Edwards specimen is also a dead shell, measuring $4\frac{3}{8}$ inches, and has been in his possession since 1958. It was found on the beach,

tenanted by a hermit crab, and is a particularly fine specimen with only slight defects, of a generally brighter coloration than the Appleton shell. Mr. Edwards is an amateur collector of some note, and made full use of his opportunities on the Duke of York Islands. He often places out rotten bananas, meat, etc., to attract hermit crabs, and it is believed that the crab inhabiting his *gloriamaris* was so lured. Although it was rumoured that a shell of this species was in his possession, this was not substantiated until the Appleton find, when he brought his shell into Rabaul for display. The Edwards specimen, together with a number of his other shells, has been given to the Australian Museum, Sydney; its estimated value is £1,500.

The writer interviewed natives from the Duke of York Islands, who had been shown photographs of the Edwards specimen. These natives were collectors of commercial shell and were well acquainted with the great variety available in the region. They were also shown the collection of the writer's wife and recognised all the kinds. On being asked whether they had ever come across *C. gloriamaris* they were quite definite that they had, and said that it was to be found, though rarely, just beneath the surface of white sand in water from 2 to 20 feet deep, below which depth they had not been. They admitted that they had possibly eaten some *gloriamaris* after breaking open the shell.

ADDITIONAL NOTES by M. R. HAYES

During December 1963 a Rabaul small ships master, Harry Hoehler, called at Teop Island, Bougainville, and purchased a basket of shells from a native woman, as was his usual custom. Amongst this basket of shells was a *gloriamaris*, which Hoehler recognized from a photograph of the Edwards specimen he had seen in the local paper. This shell measures $5\frac{1}{2}$ inches and so is the largest of the three found recently. It is in fairly good condition, rich in colour, but has some chipping on the rim and appears to have a natural fracture of at least $2\frac{1}{2}$ inches leading towards the anterior end. Hoehler is unable to say whether it was taken alive, as it was empty when he bought it. It does not seem to be as glossy as the Edwards specimen. This find makes a total of three *C. gloriamaris* recorded during the last three months of 1963 in the area bounded by the Gazelle Peninsula of New Britain to the coast of Bougainville. It might well be that this area abounds in *gloriamaris*, and that they have been unrecognized until recent publicity brought the picture of the shell before the public. The Appleton specimen was sold to Mr. Alfred Ostheimer III in Philadelphia for 400 dollars. It might well be that in some of the more remote parts of the Territory of New Guinea broken shells will be found near village cook houses. It is well known that villagers in the neighbourhood of Rabaul enjoy eating the plentiful *Conus marmoreus*.

EXPLANATION OF PLATE 17

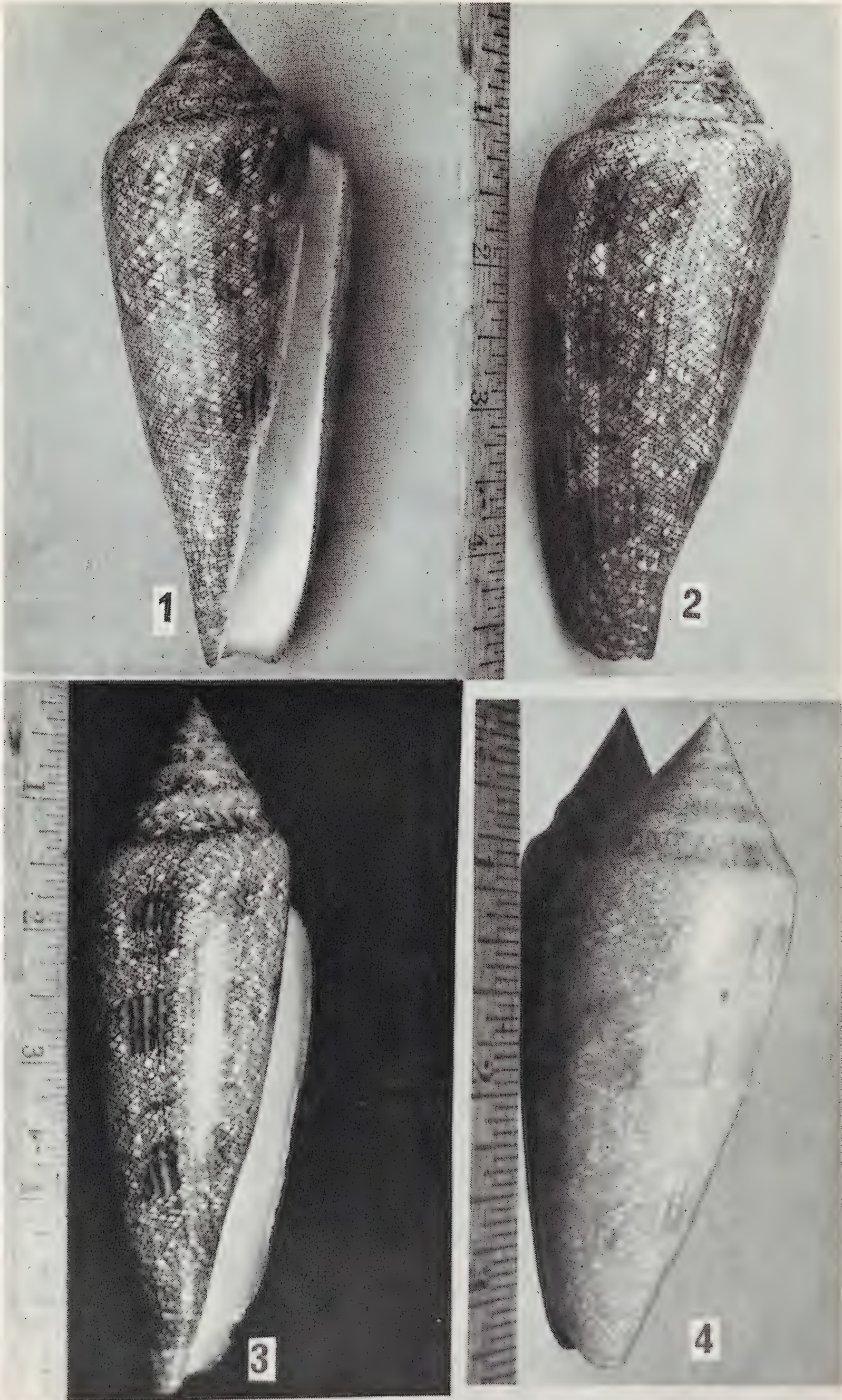
Conus gloriamaris Chemnitz.

Figures 1 and 2. Duke of York Islands, New Britain, G. Edwards.

Fig. 3. Teop Island, Bougainville, Solomon Islands, H. Hoehler.

Fig. 4. Rabaul, New Britain, Mrs. A. Appleton.

Photographs by M. R. Hayes.



CONUS GLORIAMARIS CHEMNITZ

[To face page 252

Income and Expenditure Account

[illegible]

Life Membership Fund

Dr.		Cr.
	£ s. d.	£ s. d.
To Amount of Fund, 31 December 1962	610 0 0	
New Members	60 0 0	
Dividends and Interest from Dividend Account	21 0 0	
	£691 0 0	
		By transfer to Income and Expenditure Account
		Amount of Fund, 31 December, 1963.. .. .
		£21 0 0
		670 0 0
		£691 0 0

Reserve and Research Fund

Dr.	£	s.	d.	Cr.
To Amount of Fund, 31 December, 1962	991	0	0	
Dividends and Interest from Dividends Account	30	0	0	
	£1021	0	0	
				£1021 0 0

Dividend Account

[illegible]

Balance Sheet

[illegible]

In addition to the Assets shown above are outstanding subscriptions and debts and stocks of Journals.
Examined and found correct.

P. Coxhead
M. Maitland Howard } Auditors

C. A. Raffray,
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Special Numbers: *Roebuck Memorial Number*, 1921 (Census of British land and freshwater Mollusca), 2s. *Boycott Memorial Number*, 1951 (Census of the distribution of British non-marine Mollusca), 4s. *The British Marine Mollusca*, by R. Winckworth, 1932, 2s. 6d. Ditto, *Additions and Corrections*, 1951, 2s. 3d. All post free. Members receive a discount of 50 per cent. and are entitled to receive a free copy of Winckworth's List on application to the Hon. Secretary, enclosing 6d. for postage.

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MSS. should be typed, or legibly written, on quarto or foolscap paper, on one side of the sheet only, the lines double or treble spaced, with an ample margin on the left-hand side, each folio numbered in arabic numerals at the top right-hand corner. Footnotes should be avoided, but where absolutely essential should be enclosed in square brackets in the text following the passage to which they refer, "f.n." being inserted in the margin. The position of text-figures, graphs and tables should be indicated in the margin. Authors should retain a copy of their paper, the top copy being sent for printing.

Conventions to be observed: single underlining indicates *italic* face, double underlining SMALL CAPITALS, triple underlining LARGE CAPITALS, and wavy underlining bold or **Clarendon type**. Numerals should be arabic, not roman. The title of the paper is in bold capitals, the author's name in roman capitals. When undecided, leave choice of type to the Editor.

MSS. must be submitted in finalized, fully revised and corrected form; proof corrections are expensive and should be restricted to typographical errors. It is a function of the Editor to maintain a standard of uniformity in the presentation of papers published in the *Journal*, and authors who submit papers implicitly acquiesce in his discretion in such matters; they are recommended to study the arrangement and conventions observed in previous numbers.

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The bibliographical references at the end are arranged as follows:

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2. Year of publication; if there is more than one publication by the same author in one year add *a*, *b*, etc.
3. Quote the *full* title of the paper or book, in the latter case underlined; use initial capitals for the first word, for proper names, geographical names, geological divisions, and taxonomic names above the rank of species (in German nouns have an initial capital).
4. The name of the periodical or journal in which the paper is published should be abbreviated according to the *World List of Scientific Periodicals*, or if brief cited in full, and underlined.
5. If there is a series number it should be in parentheses, e.g. (3), (n.s.), (N.F.), (B). The volume number is in arabic, bold type, without prefix "vol." The part number is omitted unless there is a special reason for its inclusion. Page numbers are in arabic, without the prefix "p." or "pp."
6. Where the reference is to a book, the place of publication should be added.

Explanation of plates follows References. Legends for text-figures and plates should be provided on separate sheets, not on the reverse of the pictures.

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- BOETTGER, C. R., 1962. Zur Systematik der in die Gattung *Pisidium* C. Pfeiffer gerechneten Muscheln. *Arch. Moll.* **90**: 227-248.
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[No. 7

Molluscs

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PLATES 18-21

Conchological Society of Great Britain and Ireland

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18 DECEMBER 1964

[No. 7

COLLECTING AT DALE

BY L. W. STRATTON

(Presidential Address, delivered 15 February 1964)

Dale Fort was opened as a Field Centre in 1947 by the Council for the Promotion of Field Studies, now the Field Studies Council. It stands eighty feet above the sea on a promontory on the western side of the entrance to Milford Haven, Pembrokeshire. Built a hundred years ago, its conversion into a Field Centre has been a major work. It now has every amenity both for living and for the carrying on of studies in geographical, geological, biological and many other fields. It is staffed by scientists who can, and do, give every assistance to student visitors.

Geologically the area comprises strongly folded and faulted rocks ranging in age from pre-Cambrian to Carboniferous. The Dale peninsula itself is composed of Red Marls of the Lower Old Red Sandstone. The cliffs at Marloes Sands are Silurian, and Ordovician rocks appear at Musselwick Sands.

The climate of Dale is mild, the rainfall low and the humidity high. Situated at the intersection of the Bristol and St. George's Channels, it is one of the windiest places in Britain. As a result of this the woods, situated in gullies or on northern slopes, do not rise above the level of the plateau. The frequency of winds and gales is shown diagrammatically on the accompanying map.

To the biologist the tides are very important. In Milford Haven the range of spring tide is nearly 20 feet, and of neap tide nearly 9 feet. Low water spring tide occurs around midnight and midday, so that the maximum amount of collecting time falls very conveniently. Winds may affect the tides, and at certain times of the year there are exceptionally high, and low, spring tides, when Dale Sands are exposed.

As the Dale peninsula is almost entirely surrounded by sea, shores are found facing in every direction of the compass. On the western side are rocky shores with great exposure to the Atlantic, with a wave fetch of 3,000 miles, while on the eastern side much of the coast is within Milford Haven, with sheltered shores and a wave fetch of as

little as half a mile. In consequence almost every type of molluscan habitat is to be found. There are the steep rocky shores already mentioned, sand and shingle beaches, salt and freshwater marshes beside an estuary, brackish water drains and lagoons and broad sand and mud flats.

It is natural, therefore, that marine biology has received a very large proportion of the attention given to the area, for it is indeed a happy hunting ground. The Mollusca have received their fair share of this attention, and *The Dale Fort Marine Fauna*, 1957, lists 155 species, comprising 6 chitons, 81 gastropods, of which 20 are nudibranchs, 62 bivalves and 6 cephalopods. A new Fauna List is now in preparation and will contain a considerable number of additional species. In view of this, no list of the marine Mollusca is given here, the main purpose of this address being to draw attention to the richness of the Dale fauna, species from every type of habitat being found in a comparatively small area. The non-marine Mollusca received little attention until 1960; in that year and in 1963 a fairly thorough survey of these was made and 46 species recorded.

In describing the molluscan fauna of rocky shores, the degree of exposure will be taken into account, those with the greatest being taken first. Other types of habitats will follow.

WEST DALE BAY

This is approached by a steep gully-path to a shingle beach. As the tide recedes a large expanse of clean, fine sand is exposed. Owing to the great exposure this is devoid of molluscan life. On the northern side of the Bay the cliff increases in height as it runs westward, and at its foot is a jumbled mass of large rock boulders. Towards low water mark these are covered with brown seaweeds (*Fucus* sp.).

At the top of the shore *Nucella lapillus* (L.) and *Patella vulgata* L. occur in small numbers, increasing as the beach is descended. *Littorina saxatilis rudis* (Maton) is common on rocks at mid-shore level, the shells being of medium size. As the *Fucus* zone is reached *Gibbula umbilicalis* (da Costa) and *G. (Osilinus) lineata* (da Costa) appear, both of large size, with an occasional *Littorina littorea* (L.). In the weed live fine large *L. littoralis* (L.), often of a deep red colour. Around L. W. N. T. *Patella aspera* Lamarck and *P. depressa* Pennant live on rocks and along the cliff foot. *Littorina neritoides petraea* (Montagu) lives in crevices in the splash zone. *Janthina britannica* Forbes and Hanley and the shells of *Sepia elegans* Orbigny have been washed up in the Bay, and *Aplysia punctata* Cuvier and the nudibranch *Polycera quadrilineata* (Müller) have been recorded.

GREAT CASTLE HEAD

This forms the southern arm of West Dale Bay, and consists of a high cliff with a line of stacks running seaward to L.W.N.T. South again is a mass of boulders, those at the lower tide levels being half buried in the sand. Here the pattern of *Patella vulgata* differs from that of the north side of the Bay, the *picta* form predominating. *P. depressa* and

P. aspera are fairly frequent, the latter being found lower down the shore than the former. *N. lapillus* is common in crevices on the sheltered sides of the stacks, and clean, well-sculptured shells are found. *G. (O.) lineata* and *G. umbilicalis* are present, though not in large numbers. *L. neritoides petraea* lives up to 30 feet above H.W.M.T., but also occurs in a much smaller form in empty barnacle shells down to L.W.N.T. Below this similar sites are occupied by *L. saxatilis saxatilis* Olivi. On the larger stacks around H.W.M.T. *L. saxatilis tenebrosa* (Montagu) lives in crevices in vast numbers. Other species which have been recorded for this area are *Diodora apertura* (Montagu), *Tricolia pullus picta* (da Costa), *Cerithiopsis tubercularis* (Montagu) and *C. clarkii* Forbes and Hanley.

MILL BAY

A brief visit was paid to Mill Bay in 1960. Here stacks and large rocks are exposed at low tide, each isolated from its neighbours, so that there is little shelter from the waves. On these the only molluscs were *Patella vulgata* and *Nucella lapillus*. Of the latter only young shells were pointed or sculptured, the older shells all being blunt and eroded. The arms of the Bay were not examined, but *L. neritoides* and all four sub-species of *L. saxatilis* live there.

WATWICK BAY

This bay was not visited, but 13 species have been recorded, including *Calliostoma zizyphinum conuloide* (Lamarck), both the coloured and white forms. The only record for the nudibranch *Euphurus claviger* (Müller) is from this beach. The only bivalve up to 1957 was *Heteranomia squamula* (L.). In 1955 a specimen of *Sepiola atlantica* Orbigny was found in a rock pool.

GUNKLE

A beach consisting entirely of large rocks and somewhat difficult of access. The usual rock dwelling Littorinids and Trochids live there, and *Ocenebra erinacea* (L.) appears. *Acanthochitona crinitus* (Pennant) and three nudibranchs have been found, with the bivalves *Modiolus barbatus* (L.) and *Hiatella artica* (L.).

CASTLE BEACH

This delightful little beach was visited twice. Unfortunately on each occasion the neap tide had already turned, so that only species living at the upper levels were found. Yet this small area has produced an amazing number of Mollusca, over 40 species having been recorded. The list is too long to enumerate here, but includes three chitons, all the commoner rock-dwelling gastropods, three *Cypraeidae* and *Lamel-laria perspicua* (L.); such genera as *Pelta*, *Elysia*, *Limapontia* and *Berthella*; four nudibranchs, and among the bivalves are *Heteranomia squamula*, *Chlamys distorta* (da Costa), *Hiatella artica*, *Lasaea rubra* (Montagu) and *Kellia suborbicularis* (Montagu).

The rocky shore from Dale Fort to the southern end of Dale Beach has been divided into four collecting areas for record purposes.

FORT BEACH

Immediately below the Fort, this beach is steep and the area exposed at low water is comparatively small. Seven rock-dwelling gastropods are recorded.

SLIP PIER BEACH

Owing to its proximity to Dale Fort this beach has received considerable attention and some 30 species have been recorded. This is the only locus within Milford Haven where all three species of *Patella* occur. Here again *Littorina saxatilis saxatilis* inhabits empty barnacle shells and small species of the genus *Cingula* are common. The chitons *Tonicella rubra* (L.), *Lepidochitona cinereus* (L.) and *Acanthochitona crinitus* (Pennant) are found and the nudibranchs *Acanthodoris subquadrata* (Alder & Hancock), *Goniodoris nodosa* (Montagu), *Jorunna tomentosa* (Cuvier) and *Aeolidia papillosa* (L.).

POINT WOOD BEACH

This produces only 18 species. *Patella aspera* and *P. depressa* are no longer found and such species as *Calliostoma zizyphinum* and *Gibbula magus* (L.) are occasional occurrences.

BRIG STONES

A small area at the south end of Dale Beach which produces only a few of the commoner rock dwellers.

BLACK ROCKS

An isolated mass of rocks at the north end of Dale Beach; two chitons and a dozen gastropods are found there. *Lepidochitona cinereus* is common, *Acanthochitona crinitus* less so. *Patella vulgata*, *Gibbula lineata*, *Littorina littorea*, *L. saxatilis*, *L. littoralis* and *Nucella lapillus* are to be found in very large numbers. Of *L. saxatilis* the sub-species *rudis* and *jugosa* occur, the former being the more abundant and very fine. In August 1963 *N. lapillus* was seen and photographed laying its egg capsules. *Calyptrea chinensis* (L.) and *Cingula cingillus* are fairly common, the latter under small pieces of rock.

MUSSELWICK

Extending from the Gann Estuary to Musselwick Point; some 40 species have been recorded from this area. While small specimens of *Mytilus* occur on all rocky shores, a large colony lives near and extends into the Gann Estuary. Both *M. edulis* L. and *M. galloprovincialis* Lamarck occur; the proportion of the latter appears to be increasing during recent years. Both species are more abundant at Angle Bay. Seven species of nudibranchs have been taken, *Rostanga rufescens* Iredale & O'Donoghue, *Archidoris pseudoargus* (Rapp), *Jorunna tomentosa*, *Coryphella verrucosa pellucida* Alder & Hancock, *Facelina auriculata* (Müller), *Aelidiella glauca* (A. & H.) and *Aeolidia papillosa*. Gastropods

include *Diodora apertura* (Montagu), *Acmaea virginea* (Müller), *Cingula semicostata* (Montagu), *C. cingillus*, *Rissoa parva* (da Costa), *Natica catena* (da Costa), both species of *Trivia* and *Ocenebra erinacea*. The bivalves *Monia patelliformis* (L.), *Chlamys distorta*, *Kellia suborbicularis* and *Hiatella arctica* are found attached to or in the crevices of rocks, while *Chlamys opercularis* (L.), *Pecten maximus* (L.), *Ostrea edulis* L. and *Venus fasciata* (da Costa) are found on occasion.

The sandy areas consist of Dale Beach, Dale Sands and parts of the Gann Flats.

DALE BEACH

Dale Beach is composed of coarse sand mixed with small stones, but below L.W.N.T. the sand is fine without stones. The list of gastropods consists mainly of single records of such species as *Mangelia nebula* (Montagu), *Acteon tornatilis* (L.), *Cylichna cylindracea* (Pennant), and *Tricla lignaria browni* Leach. The bivalves include *Nucula turgida* Leckenby & Marshall, *Thyasira flexuosa* (Montagu), *Lucinoma borealis* (L.), *Laevicardium crassum* (Gmelin), *Mysia undata* (Pennant), *Abra prismatica* (Montagu), *Donax vittatus* (da Costa), oddly rare in the area, *Phaxas pellucidus* (Pennant) and *Thracia phaseolinus* (Lamarck). Here, too, have been washed up the cephalopods *Alloteuthis subulata* (Lamarck) and *Eledone cirrhosa* (Lamarck).

GANN FLATS

The Gann Flats occupy a roughly rectangular area about half a mile wide. At L.W.O.S.T. the water recedes almost as much, exposing over 600,000 square metres (0.238 square miles). The sides are steep, but the northern shore is separated by a shingle bank and a wall from the Pickleridge Lagoons. The floor of the Flats slopes very gently southwards. There is a ridge of fine sand down the middle with muddy sand overlying a substratum of gravel on either side.

The outflows from the Gann Estuary and the Pickleridge Lagoons unite to flow across the Flats a little east of centre. In the upper part there is a clear channel, but at the lower tide levels the flow spreads out and becomes diffused. There are smaller flows on the western side due to seepage through the shingle from the Lagoons.

Although over 20 species of gastropods have been recorded for the Flats, the majority occur only occasionally. However, very large *Littorina littorea*, often with the spire eroded, are fairly common. *Calyptraea chinensis* and *Gibbula cineraria* (L.) are found with some frequency at the lower tide levels, usually in old bivalve shells. *Buccinum undatum* L. can be found at extreme low water and an occasional living *Turritella communis* Risso.

As might be expected, bivalves are well represented and over 30 species have been taken. The most obvious is *Venerupis pullastra* (Montagu), the empty shells lying about in very large numbers. The larger shells are generally of a yellowish brown colour, the patterns often being partially obscured by this colouring. The younger

shells are paler, with varying amounts of pattern from all-over to single small streaks, while pure white shells occur. *Venerupis decussata fusca* Gmelin is common and grows to a good size. Those dug from the more muddy areas are much discoloured, some being completely black. Other common bivalves are *Venus striatula* (da Costa) and *Cardium edule* L. Among the less frequent occurrences are *Dosinia exoleta* (L.), *Tellina fabula* Gmelin, *T. tenuis* da Costa, *Thracia phaseolinus*, and in 1963 *Tellina donacina* L. was found. *Solen marginatus* Pulteney and *Barnea candida* (L.) live in isolated patches of mud. *Gari fervensis* (Gmelin) is seldom found living, but a dozen or so empty shells in perfect condition may be picked up in one spring tide exposure, especially off Black Rocks. *Montacuta ferruginosa* (Montagu) lives on the tests of sea urchins.

DALE SANDS

The sands off Black Rocks connect the Gann Flats to Dale Sands, a bank of fine sand exposed only once or twice a year at exceptionally low spring tides. The Dale Sands have been notable for many years for a vast bed of *Ensis siliqua* (L.). Unfortunately one of the very low spring tides occurred during March 1963, when large numbers of *Ensis* were killed by the frosts of that severe spell of weather. The Sands were also exposed in August 1960, when *Cardium echinatum* L. was found in hundreds on the surface, and *Lutraria lutraria* (L.) and *Cyprina islandica* (L.) were dug. *Ensis ensis* (L.) and *Ensis arcuatus* (Jeffreys) occur in smaller numbers with *Ensis siliqua*. These species also extend into the Black Rocks sands, where in addition *Pharus legumen major* Buquoy and *Macra corallina cinerea* Montagu live with other more widespread bivalves.

A good deal of dredging has been done within Milford Haven, and about 40 species have been obtained. The bottom in Dale Roads is largely sandy, with stones to the north and mud increasing to the south. Around Stack Rock there are many small stones and a good deal of clinker.

In Dale Roads *Turritella communis* and *Aporrhais pespelicani* are common and *Erato voluta* (Montagu) and *Philine aperta* (L.) occur. Among the bivalves *Modiolus modiolus* (L.), *Astarte sulcata* (da Costa) and *Pandora pinna* (Montagu) live in deeper water. In 1957 a dredge full of shells of *Venerupis rhomboides* (Pennant) was taken.

Clathrus clathrus (L.) and *Akera bullata* Müller live off Stack Rock. In 1960 *Nucula nucleus* (L.), *Anomia ephippium* L., in dead shells of *Pecten maximus*, and *Cardium exiguum* Gmelin were taken with such species as *Calliostoma zizyphinum* and *Gibbula magus*.

The Gann Stream is tidal as far as Mullock Bridge. In the lower reaches *Cyprina islandica* is found at the lowest tide levels; slightly higher are *Venerupis decussata fusca* with *Barnea candida* and *Mya arenaria* L. The last is occasional with *Mya truncata* L. somewhat rare, up to within 500 to 600 yards of Mullock Bridge. *Cardium edule* extends even

higher, *Scrobicularia plana* (da Costa) nearly as high, but this last species is most common in mud lower down, where *Macoma balthica* (L.) also occurs in small numbers.

The lagoons, salt pans and drains of the Pickleridge area are flooded at each spring tide. The freshwater streams running in are small, so that the salinity varies little. The Mollusca represent a brackish to salt water fauna. Round the shores of the lagoons the sub-species *rudis* and *jugosa* of *Littorina saxatilis* are found. Both in 1960 and 1963 hundreds of small bivalve shells up to an inch long were washed up, many still containing the dead animal. These proved to be young *Mya arenaria*. The salt pans swarm with *Hydrobia ulvae* (Pennant), some up to 10 mm. long. In one drain *Hydrobia ulvae*, *Littorina saxatilis* and *Potamopyrgus jenkinsi* (Smith) lived together. *Leucophytia bidentata* (Montagu) has been found under stones, and *Ovatella myosotis* (Draparnaud) lives in some of the drains.

For the study of non-marine Mollusca the Dale peninsula makes a very convenient unit. It is composed almost entirely of Old Red Sandstone, overlaid in a few places with areas of boulder clay, and therefore tends to be acid.

Forty-six species of land and freshwater Mollusca have so far been recorded. Of the land snails *Helix aspersa* (Müller), *Helix* (*Cepaea*) *nemoralis* L. and *Discus rotundatus* (Müller) are the most widespread, and in certain loci *Clausilia bidentata* (Ström) and *Monacha* (*Ashfordia*) *granulata* (Alder) are the most abundant. The last named is found in every sort of habitat from wet to dry. Contrary to Boycott's dictum (Boycott, 1934) it is a woodland species at Dale, but also found in clumps of heather on a wind-swept cliff top.

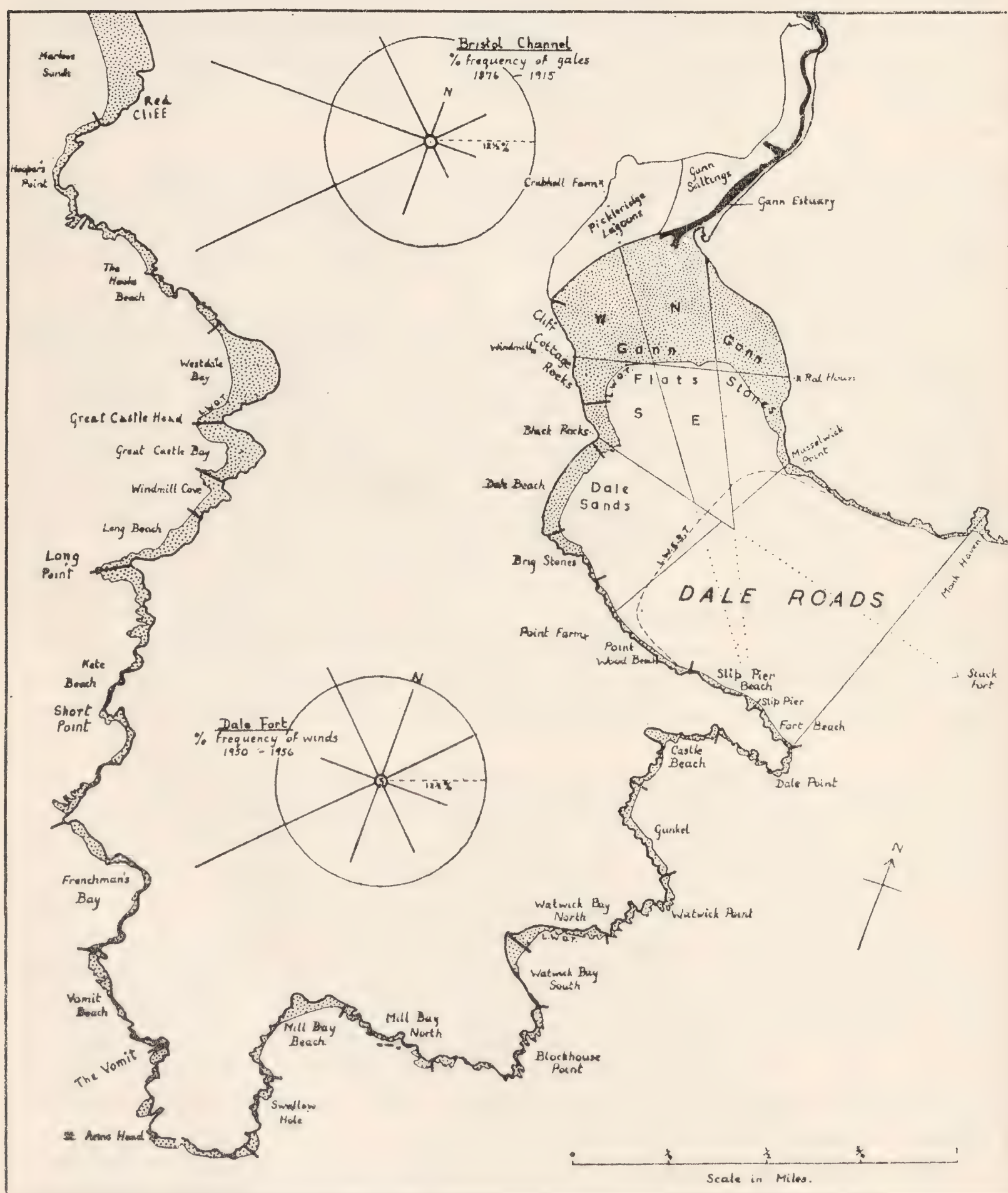
The high humidity is particularly favourable for slugs, *Arion ater* (L.) being common in most places, with *Arion subfuscus* (Draparnaud) and *Limax maximus* L. as woodland species. The beautiful var. *bicolor* Taylor of *L. maximus* is not uncommon in Haygardhay Wood, which also has *Zonitoides excavatus* (Alder), our only obligatory calcifuge snail.

At West Dale Bay a most interesting snail fauna is found. On screes at the foot of the cliff ten species include *Helix nemoralis*, *Helicella itala* (L.) and *Helicella virgata* (da Costa). These last two also live on knapweed on the top of the cliff immediately above. During the frequent gales both these loci are soaked with salt water, the first by the waves, the second by spray. On the other hand, the sea has carried to these two habitats sea sand, making them calcium rich, which probably accounts for the presence of these calcicole species. *Oxychilus draparnaldi* (Beck), a garden species in most parts of the country, is found wild in one or two places at Dale. While the shells of *Helix nemoralis* at West Dale Bay are thick and opaque, these in other places are thin, almost transparent and rich in colour.

The freshwater habitats are few. Swift flowing streams with little or no vegetation contain *Potamopyrgus jenkinsi* and *Ancylus fluviatilis* Müller, which extend in some streams right down to the shore. The

largest bodies of fresh water are the irrigation ponds at Maryborough Farm. These teem with *P. jenkinsi*, which lives with *Planorbis leucostoma* (Millet), *Lymnaea truncatula* (Müller), *Pisidium casertanum* (Poli) and *P. personatum* Malm. *Lymnaea peregra* (Müller) lives in one stream, a cattle pond and in the River Gann above Mullock Bridge.

A detailed account of the non-marine Mollusca is being published in *Field Studies*. Special studies of some of the marine habitats have been published by the Field Studies Council and are included in the bibliography below.



Map of Dale peninsula (by courtesy of Bristol Naturalists' Society).

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ASPATHERIA (SPATHOPSIS) BOURGUIGNATI
(BOURGUIGNAT).

BY T. E. CROWLEY

(Read before the Society, 21 March 1964)

This species was described as *Spatha* (*Spathella*) *bourguignati* Ancey by Bourguignat (1885) and again under three additional trivial names in 1889; Ancey's name was in manuscript only. The locality cited for all the shells was "The south shore of Lake Victoria".

Pilsbry and Bequaert (1927) considered that *Aspatheria hartmanni* (Martens) should properly be regarded as a subspecies of the South African *A. wahlbergi* (Krauss), and that Bourguignat's species was a mere local variety of the latter; they provide a synonymy. As, however, none of these shells occurred within the Belgian Congo, the area which was the subject of their monograph, no specimens were ever collected or seen alive by Bequaert. The usually accepted localities for both *A. wahlbergi* and *A. hartmanni* are far distant from Lake Victoria (Connolly, 1939, 617). A fairly constant difference between *A. wahlbergi* and *A. bourguignati* appears to be the position of the umbones, which are at approximately one-third or more along the length of the shell in the former, and about a quarter in the latter, to which the name *A. wahlbergi dorsalis* was given by von Martens (1897, 247).

Mandahl-Barth (1954, 155) considers *bourguignati* to be a good species and points out its distinctive character. His study was confined to museum specimens, and despite extensive experience in Central Africa he says (p. 55): "This . . . is the only species known from Lake Victoria which neither Mr. Cridland nor the present author have succeeded in finding". The only material available to Mandahl-Barth at the time, on which to base his description, was a single specimen from Major Connolly's collection, now in the possession of

Mr. T. Pain, and which was believed to come from Lake Victoria, without more definite locality. Mandahl-Barth did not believe that *Aspatheria bourguignati* was anywhere common in Lake Victoria, from which but few shells have been recorded, but put forward the opinion that the rivers of Tanganyika which empty into the Lake, and from which von Martens (1897) quoted a series of finds, would be found to provide the true locality to which the species belonged.

The British Museum (Natural History), per Mr. N. Tebble, to whom my thanks are due, inform me that their only localised specimens are recorded as:

Njamagodjn, Victoria Nyanza (Emin Pasha), one specimen.

Musozi, Victoria Nyanza (col. Deline Ratcliffe), three specimens.

Both localities are believed to be on the southern (Tanganyika) shore of the lake. Most of the other specimens known (which are not numerous) appear to come either from Lake Victoria or from the rivers of northern Tanganyika.

Three shells were recently sent to me by Mr. and Mrs. H. Livingstone Peake of Eldoret, Kenya, which are ascribable to *A. (S.) bourguignati*. These they had picked up on the banks of a small lake about five acres in area, formed by damming the Voi River about 75 miles north of Mombasa on the main Mombasa-Nairobi road, in the game park. The Aruba Dam, as it is called, was constructed to retain water for the game, since the river dries up almost completely during the hot season. Elephant, rhinoceros, buffalo, lion and antelope drink there daily in sight of the little game lodges on the bank. The shells are described as "literally in heaps" where open-bill storks had eaten the mussels after fishing them out of the lake, leaving the shells undamaged.

The specimens received had been picked from one of the heaps and although empty when found, were in fresh condition. As the shells were undamaged and closed, with the hinges intact, the method used by the storks in feeding on the mollusc must remain in doubt pending further observations, but a very slight chipping of the shells at the posterior end may be seen. The facts have an interesting reflection on the scarcity of records on *Anodonta* as a food for swans and ducks.

The three specimens received, which are well grown, and almost identical in appearance, agree well with Mandahl-Barth's study. The largest is 113 mm. long, with the umbones 36 mm. from the anterior end, 52 mm. high and 30 mm. in thickness. The umbones, though slightly eroded, appear to have had very little sculpture; the basal margin has a slight but definite concavity in all cases. The colour is a brilliant olive brown fading to dark green in the umbonal region; annual growth rings are clearly marked. The surface of the shell is roughened and dull at the posterior end in all examples, and a feature here which has apparently escaped description consists in a series of moderately bold radial corrugations on the surface so roughened, dying out as the ventral and dorsal surfaces are reached, and rather similar in character to the sculpturing which can be observed in the distantly related North American *Lasmigona costata* (Rafinesque).



Aspatheria bourguignati (Bourguignat), natural size

[To face page 264

The appearance of the three shells is that which would be expected if the animals lived embedded in a fine protective silty material with the posterior end only exposed, which is a customary attitude for most of the Unionidae.

It seems possible that *A. bourguignati* has been gathered on the eastern (Kenya) shores of Lake Victoria, but I have failed to find records of it either from there or elsewhere in Kenya. The present well authenticated locality may therefore provide a further clue to the distribution of this mollusc.

I am indebted to Mr. R. F. Cumberland and Mr. R. P. Scase for kindly supplying photographs of *A. bourguignati*.

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EXPLANATION OF PLATE 18

Aspatheria bourguignati (Bourguignat), natural size: Aruba Dam, Kenya. Photographs by R. F. Cumberland.

ON *LIMICOLARIOPSIS D'HERICOURTIANA* (BOURGUIGNAT)

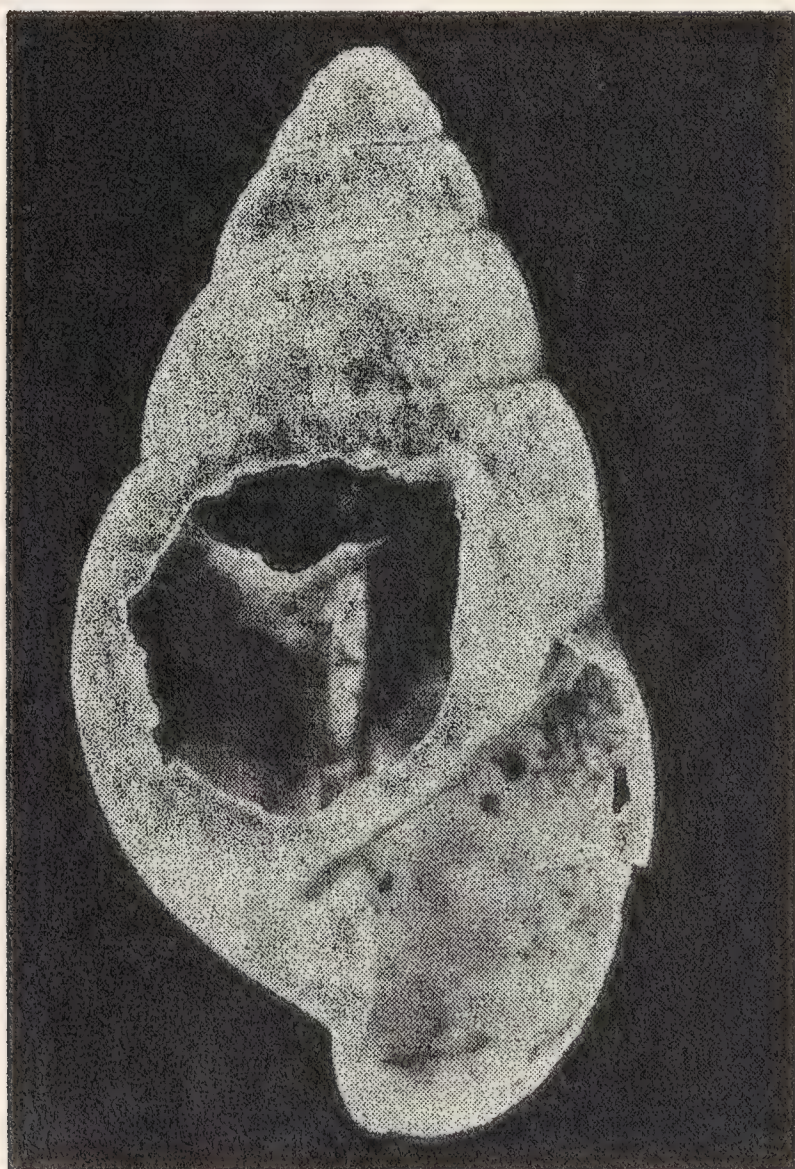
BY T. E. CROWLEY AND T. PAIN

(Read before the Society, 11 April 1964)

As was pointed out in the authors' monograph on *Limicolariopsis* (Crowley & Pain, 1961, 7), some species of this genus were described by their authors as *Limicolaria*, either because they appeared prior to 1910, the year of the publication of *Limicolariopsis* by d'Ailly, or if later, because this genus remained somewhat obscure and apparently little noticed, its position in the African fauna being frequently overlooked by malacologists. It is to be expected therefore that existing species, usually described as *Limicolaria*, will from time to time be located in collections. The species here dealt with falls into this category, certain specimens having been noted as belonging to *Limicolariopsis* during the course of examining the extensive series of *Limicolaria* in the Musée Royal de l'Afrique Centrale at Tervuren. These shells were collected at Goré (Kaffa) in Ethiopia in 1955 and had been labelled "*Limicolaria* sp." A specimen was submitted to Dr. J. C. Bequaert, who identified it as *L. d'hericourtiana* and confirmed our opinion that it is in fact a

Limicolariopsis. The holotype is preserved in the Muséum Nationale d'Histoire Naturelle, Paris, and through the kind offices of Monsieur J. Gaillard we have received a photograph of it which is here reproduced.

The shell of *L. d'hericourtiana* is fairly solid, somewhat opaque, with a very obtuse and bulbous apex; whorls $7\frac{1}{2}$, the first $3\frac{1}{2}$ nearly smooth, the remainder sculptured with coarse longitudinal striations, which become obsolete below the periphery of the body whorl; the columella is erect and noticeably twisted, the umbilicus almost completely covered by the columellar fold. It resembles in general appearance *L. obtusa* (Thiele), also from Ethiopia, but differs in being even more globose, with the apex larger and more obtuse, and particularly in the coarse sculpture present on the lower whorls, the strongly twisted columella and the minute umbilical chink. In common with most of the Achatinidae, both unicolorous and flammulated examples occur. Dimensions of an adult shell from Goré: length 55 mm., greatest width 30 mm., aperture 28 x 14 mm.



***Limicolariopsis d'hericourtiana* (Bourguignat)**

Limicolaria d'hericourtiana Bourguignat, 1885, 15 (fig. 20 of plate); Kobelt, 1895, 80, pl. 29, fig. 2 (copy); Pilsbry, 1904, 274, No. 40, pl. 17, fig. 84.

Original description (translated from the French by Pilsbry): Shell narrowly perforate (almost completely covered), swollen, little lengthened, rather solid, somewhat opaque, glossy, uniformly ochreous, strongly costulate, the riblets regular, produced, wide on the last whorl, and elegantly encircled with very minute and numerous spiral lines. Spire oblong, obtusely and rather shortly tapering, obtuse at the summit, the apex paler, smooth. Whorls seven, a little convex, regularly increasing, separated by a moderately impressed suture, subcrenulate-marginate on the last whorl. Last whorl exactly half the total length, aperture a little oblique, semiovate, somewhat channelled at the base of the columella; peristome acute. Columella straight, slightly twisted, widely dilated and almost closing the perforation, not vaulted in the middle, but subarcuate, somewhat channelled above, acutely attenuate below.

Height 50, width 27, aperture 25 x 14 mm. (holotype).

N. E. Africa, neighbourhood of Abdul Rassul, near Anboker (Soleillet).

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***Conus gloriamaris*: additional notes**

Since the publication of the article in the last number of this *Journal* (p. 251), further information has been received from Dr. R. Tucker Abbott. The Hoehler shell (plate 17, fig. 3) has been bought by an American lady for \$2000 and is exhibited in the Academy of Natural Sciences at Philadelphia, to which it has been bequeathed. A rather poor worn specimen, found by Mr. Rex Blow of Sabah Plantation, Bougainville, was bought for \$220 by a Philadelphia lady and presented to the Academy. Mr. Bert Speer reports another specimen which has been mangled by an octopus. Mr. John Crowhurst collected a fine shell, 4½ inches in length, at Sio, north-east New Guinea. This specimen is undamaged except for a large chip on the lip, and has been sent to Dr. Abbott.

M. R. HAYES

THE BRITISH SPECIES OF *SPISULA*

BY R. M. VAN ÜRK

(Rijksmuseum van Natuurlijke Historie, Leiden)

(Read before the Society, 21 March 1964)

The determination of the species of the genus *Spisula* Gray, which comprises some of our most common bivalves, has often presented difficulties. Three species can be distinguished, *S. elliptica* (Brown, 1827), *S. solida* (Linné, 1758) and *S. subtruncata* (da Costa, 1778). There is little occasion for confusion once the true characters which separate the species from one another are recognized. Difficulties have arisen mainly as a result of depending too much, if not entirely, on external features of the shell. Differences in the hinge, muscle scars and sculpture prove to be of major diagnostic importance and, since several of these features are constant and readily seen with a lens, or even with the naked eye, they are very convenient for separating the species. The key below is based on the following characters: the presence or absence of a regular fan-shaped groove-pattern, the structure of the central part of the hinge, and the somewhat variable but still very useful characters of the anterior adductor scar and the pallial sinus.

The distinction between *Spisula* and the allied genus *Macra* L. is not always very easy, since it depends on the presence in *Macra* of a thin fulcrum separating the external part of the ligament from the internal, this fulcrum being absent from *Spisula*. A more readily observable feature is found in the lateral teeth, which are transversely sulcate in *Spisula*, but quite smooth in *Macra* (as far as the British species are concerned); this difference should not, however, be regarded as a generic character.

KEY TO BRITISH SPECIES OF *SPISULA*

1. Dorsal areas grooved, with regular fan-shaped groove-pattern—2.
Dorsal areas smooth—3.
2. Ligament-pit broad (occupying $\frac{2}{3}$ to $\frac{3}{4}$ of the central part of the hinge); bifid cardinal tooth in the left valve short (reaching about half-way to the base of the hinge-plate); pallial sinus long (up to about twice as long as the posterior adductor scar); inner margin of the anterior adductor scar with an undulation—*S. solida*.
Ligament-pit narrow (occupying about half the central part of the hinge); bifid cardinal tooth in the left valve long (reaching or nearly reaching the base of the hinge-plate); pallial sinus short (only slightly longer to about $1\frac{1}{2}$ times as long as the posterior adductor scar); inner margin of the anterior adductor scar quite straight—*S. subtruncata*.
3. Ligament-pit narrow (occupying about $1\frac{1}{2}$ of the central part of the hinge); bifid cardinal tooth in the left valve long (reaching

or nearly reaching the base of the hinge-plate); pallial sinus long (up to about twice as long as the posterior adductor scar); inner margin of anterior adductor scar with an undulation—

S. elliptica.

Not a combination of these characters: worn shells of *S. solida* and *S. subtruncata*, in which the groove-pattern on the dorsal areas is no longer visible.

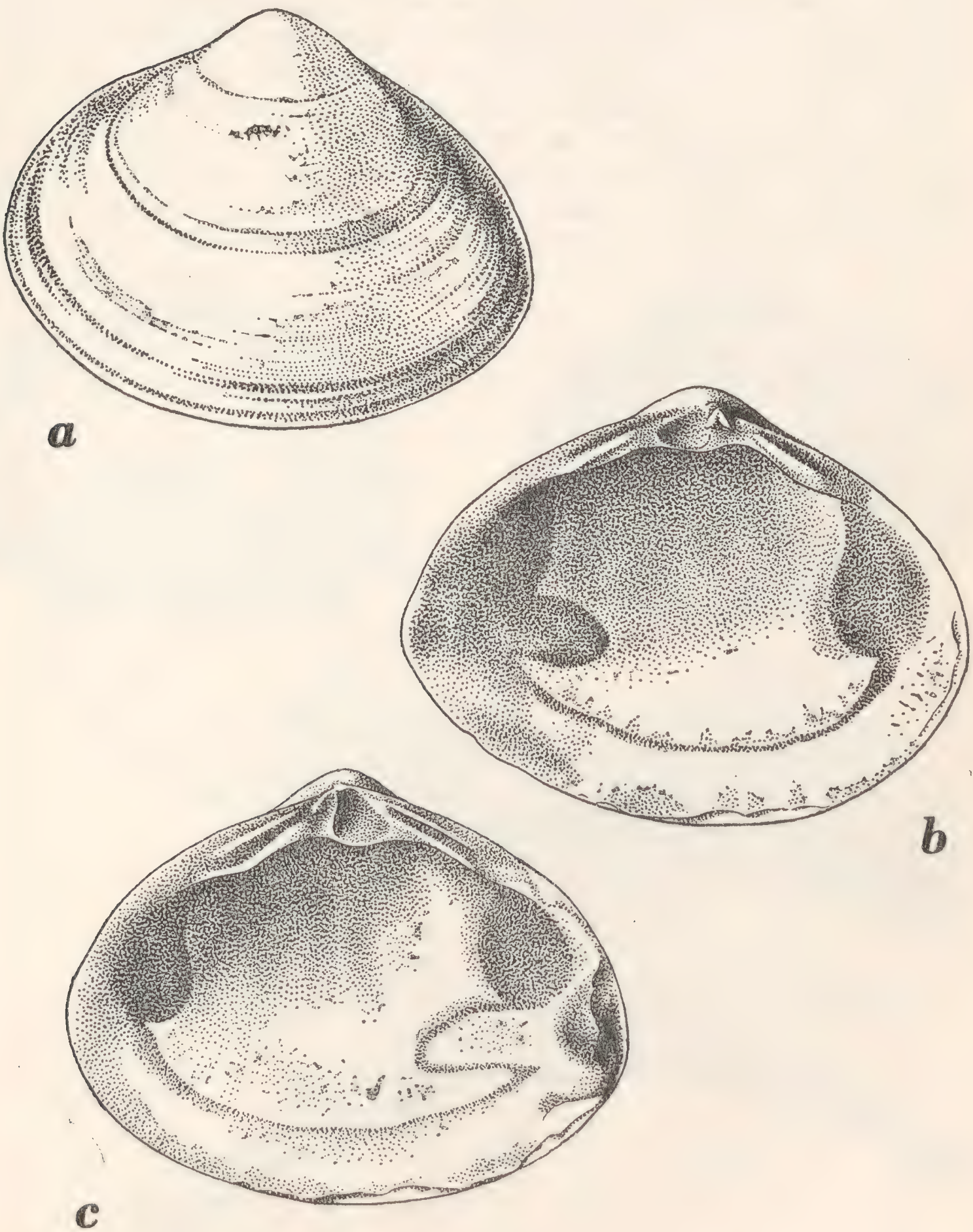


Figure 1. *Spisula solida* (L.), x $1\frac{1}{2}$.

(a) exterior of left valve; (b) interior of left valve; (c) interior of right valve.

1. *Spisula solida* (L.)

HINGE. Left valve: the branches of the bifid cardinal tooth reach half-way to the base of the hinge-plate: left branch directed N.N.E.—S.S.W. to N.E.—S.W.; the thin fulcrum bordering the ligament-pit directed N.—S. to N.N.E.—S.S.W. Right valve: left cardinal tooth about half the length of the thin fulcrum bordering the ligament-pit: the fulcrum directed N.—S. to N.N.W.—S.S.E. Ligament-pit occupying about $\frac{2}{3}$ to $\frac{3}{4}$ of the central part of the hinge, in full-grown specimens often distinctly concave at the base.

MUSCLE SCARS: Pallial sinus about twice as long as the posterior adductor scar, usually narrowed towards the top, dorsal margin convex (with a bend when fully developed), ventral margin straight. Posterior adductor scar: inner margin with an undulation.

DORSAL AREAS. Grooved, with a fan-shaped groove-pattern.

SCULPTURE. Surface of the shell smooth or nearly smooth, in the latter case with fine concentric striae which are relatively most pronounced near the ventral and posterior parts of the shell; in addition a few well-marked lines of growth are usually present.

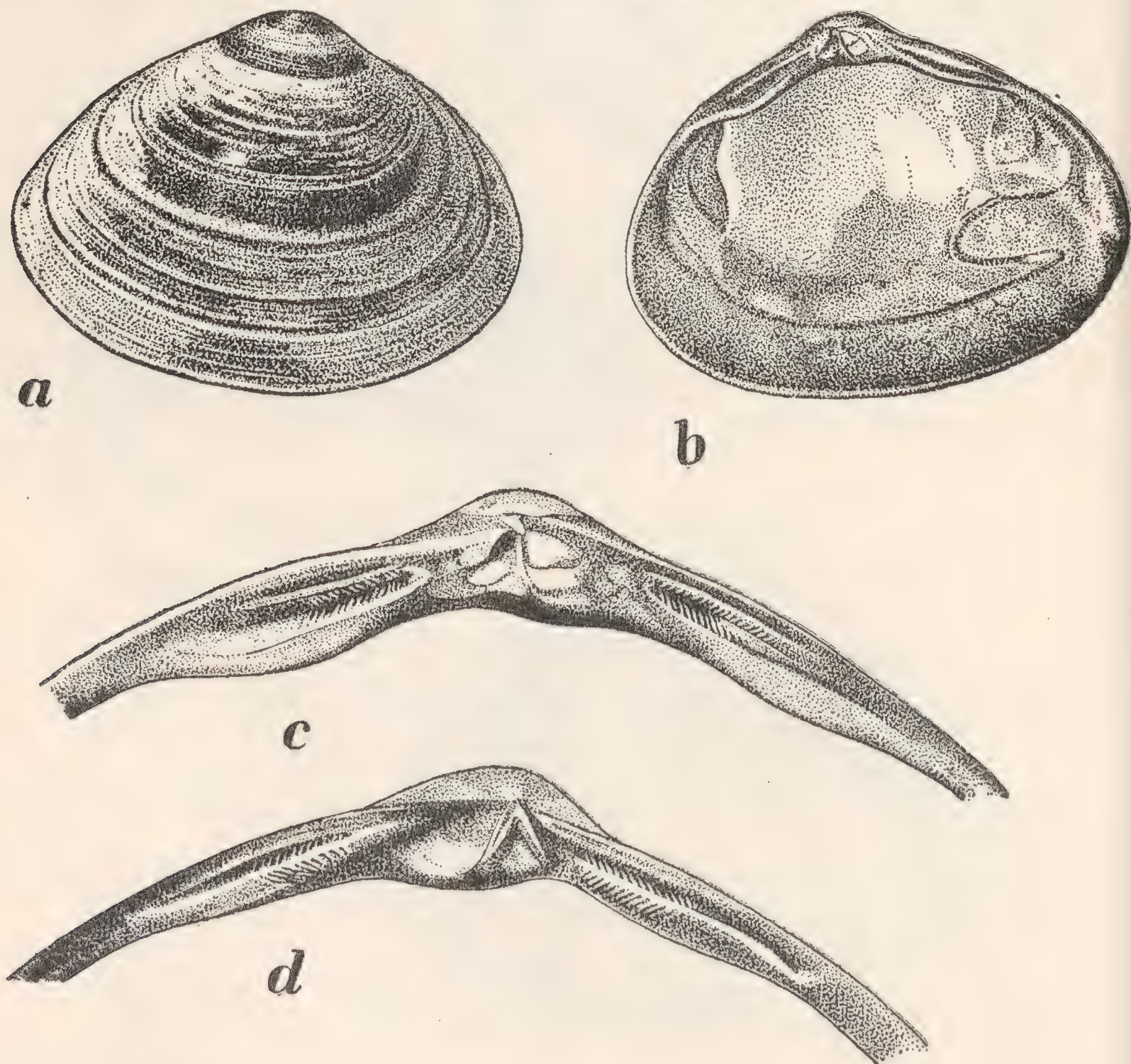


Figure 2. *Spisula elliptica* (Brown).

(a) exterior of right valve, $\times 1\frac{3}{4}$; (b) interior of right valve, $\times 1\frac{3}{4}$; (c) hinge of right valve, $\times 5$; (d) hinge of left valve, $\times 5$.

(Drawn from subfossil shells from Netherlands beach.)

SHAPE. Shell oval, equilateral (symmetrical) to rather strongly inequilateral (asymmetrical), in the latter case the posterior end usually being longer than the anterior; dorsal edges gently sloping, slightly convex, anterior end rounded, posterior end rounded or slightly angled.

DIMENSIONS. Up to at least 4.5 cm. in length, 3.5 cm. in height and 2 cm. in width or thickness.

DISTINGUISHING CHARACTERS. Full-grown *S. solida* is easily recognizable on account of its dimensions, since it reaches a larger size than the other two species. Young individuals often greatly resemble *S. elliptica*. In all stages, however, reliable distinguishing characters can be found in the grooved dorsal areas, the broad ligament-pit, the short (bifid) cardinal tooth in the left valve and usually in the somewhat different shape of the pallial sinus.

VARIABILITY. The most important variation is in the length-height ratio. Every shape from elliptical to almost circular may be found. The average length: height ratio is about 1:1.32 or 1:1.33. Longitudinally compressed specimens have, in addition, more pronounced umbones, while the posterior part of the shell is somewhat shorter than the anterior. The variety or form *truncata* Montagu (*Macra truncata* Montagu, 1808) may be regarded as the final stage of this variation series: it is almost triangular in outline, with the dorsal

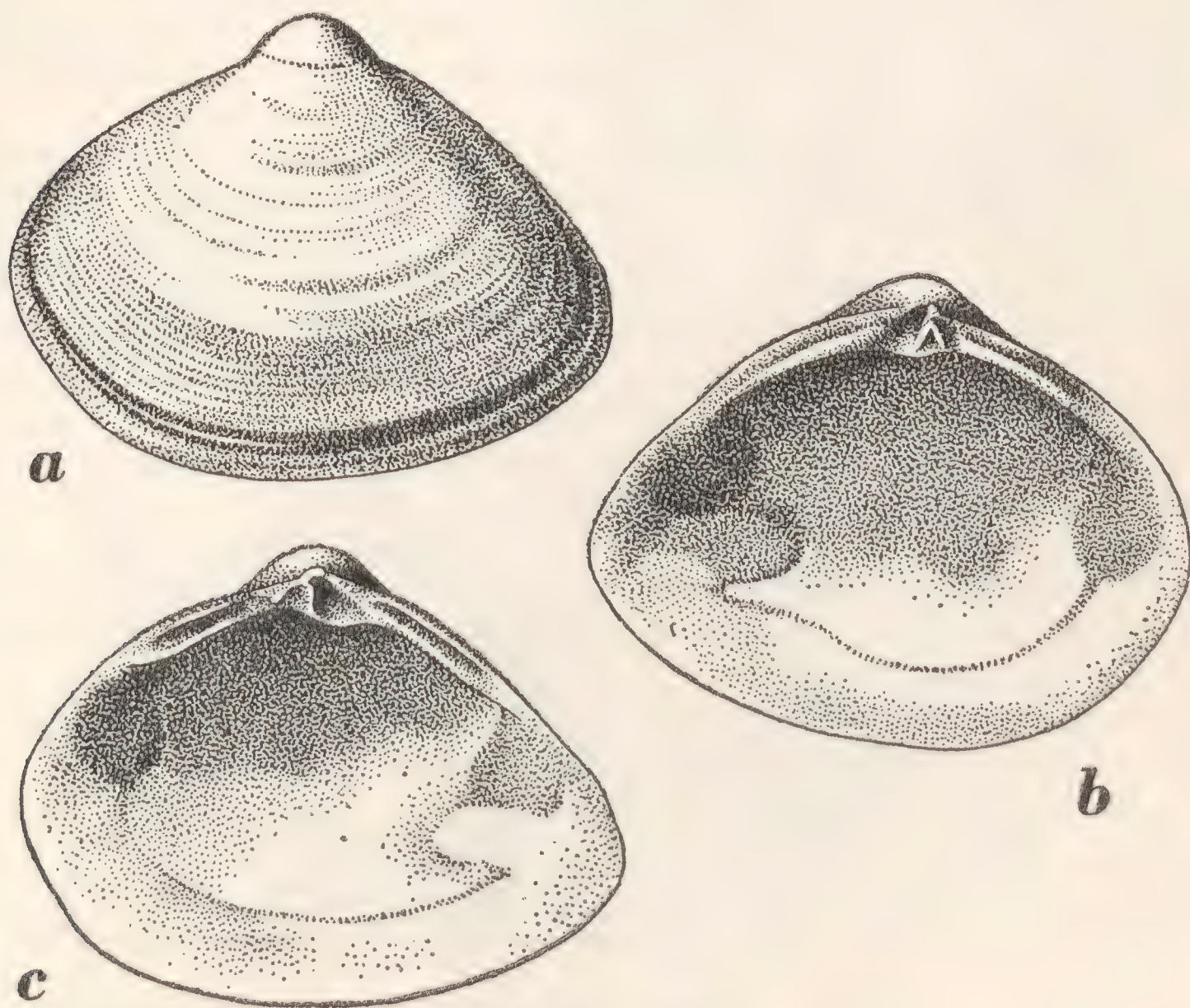


Figure 3. *Spisula subtruncata* (da Costa), x $1\frac{4}{5}$.
 (a) exterior of left valve; (b) interior of left valve; (c) interior of right valve.
 (Drawn from a single fresh shell.)

edges strongly sloping and the anterior part of the shell somewhat exceeding the posterior part in length. Otherwise it is indistinguishable from typical *S. solida*. Two specimens of this peculiar form were kindly sent to me for examination by Dr. Bowden of Glasgow, from the islands of Eriskay in the Outer Hebrides and Rum in the Inner Hebrides.

Several minor variations are also found, e.g. in the thickness of the shell and the length of the posterior end, but they are unlikely to cause any difficulty in identification.

GEOGRAPHICAL DISTRIBUTION. *S. solida* occurs at least from Denmark and the British Isles southwards to Portugal and the Atlantic coast of Spain; it is absent from the Mediterranean Sea. Its northern limit is uncertain and investigation, especially as to its Norwegian range, is required. It is probably distributed all around the British Isles; I have seen examples from Aberlady on the Firth of Forth and from Cork, S.W. Ireland. From the latter locality I received a fine specimen from Mr. L. S. Atkins.

2. *Spisula elliptica* (Brown)

HINGE. Left valve: the branches of the bifid cardinal tooth reach the lower margin of the hinge-plate; left branch directed $\pm$ N.E.-S.W.; the much thinner fulcrum bordering the ligament-pit lies parallel to it. Right valve: left cardinal tooth about $\frac{3}{4}$ of the length of the thin fulcrum bordering the ligament-pit; fulcrum directed $\pm$ N.W.-S.E. Ligament-pit occupying about $\frac{1}{2}$ of the central part of the hinge, not or only slightly concave at the base.

MUSCLE SCARS. Pallial sinus $1\frac{1}{2}$ to 2 times as long as the posterior adductor scar, of almost uniform width throughout. Posterior adductor scar: inner margin with an undulation.

DORSAL AREAS. Smooth, without a fan-shaped groove-pattern.

SCULPTURE. The surface of the shell is smooth or nearly so, in the latter case with only fine concentric striae near the ventral and posterior part of the shell; in addition a few lines of growth are usually present.

SHAPE. Shell oval, equilateral (symmetrical) or slightly inequilateral (asymmetrical), in the latter case usually as a result of the posterior end being longer than the anterior. Dorsal edges gently sloping, slightly convex, anterior and posterior ends rounded.

DIMENSIONS. Up to at least about 3 cm. in length, 2.2 cm. in height and 1.4 cm. in thickness.

DISTINGUISHING CHARACTERS. *S. elliptica*, though often regarded as a mere variety of *S. solida*, is nevertheless quite a distinct species. It is a moderate sized, equilateral (symmetrical), more or less elliptical *Spisula* of which the dorsal areas are not grooved, unlike the other two species. The hinge is almost exactly like that of *S. subtruncata*, while the pallial sinus and the anterior adductor scar resemble those of *S. solida*.

VARIABILITY. As in *S. solida*, the main variation is in the length-height ratio, all gradations from elliptical through oval to almost completely circular being found. But whereas in *S. solida* the mean

is most commonly met with, *S. elliptica* may become much more elliptical, while on the other hand specimens occur which have all the appearance of an equilateral *S. subtruncata* or a young *S. solida* of average length-height ratio. Both forms and their intermediates may be found together, since there seems to be no correlation between length-height ratio and geographical distribution.

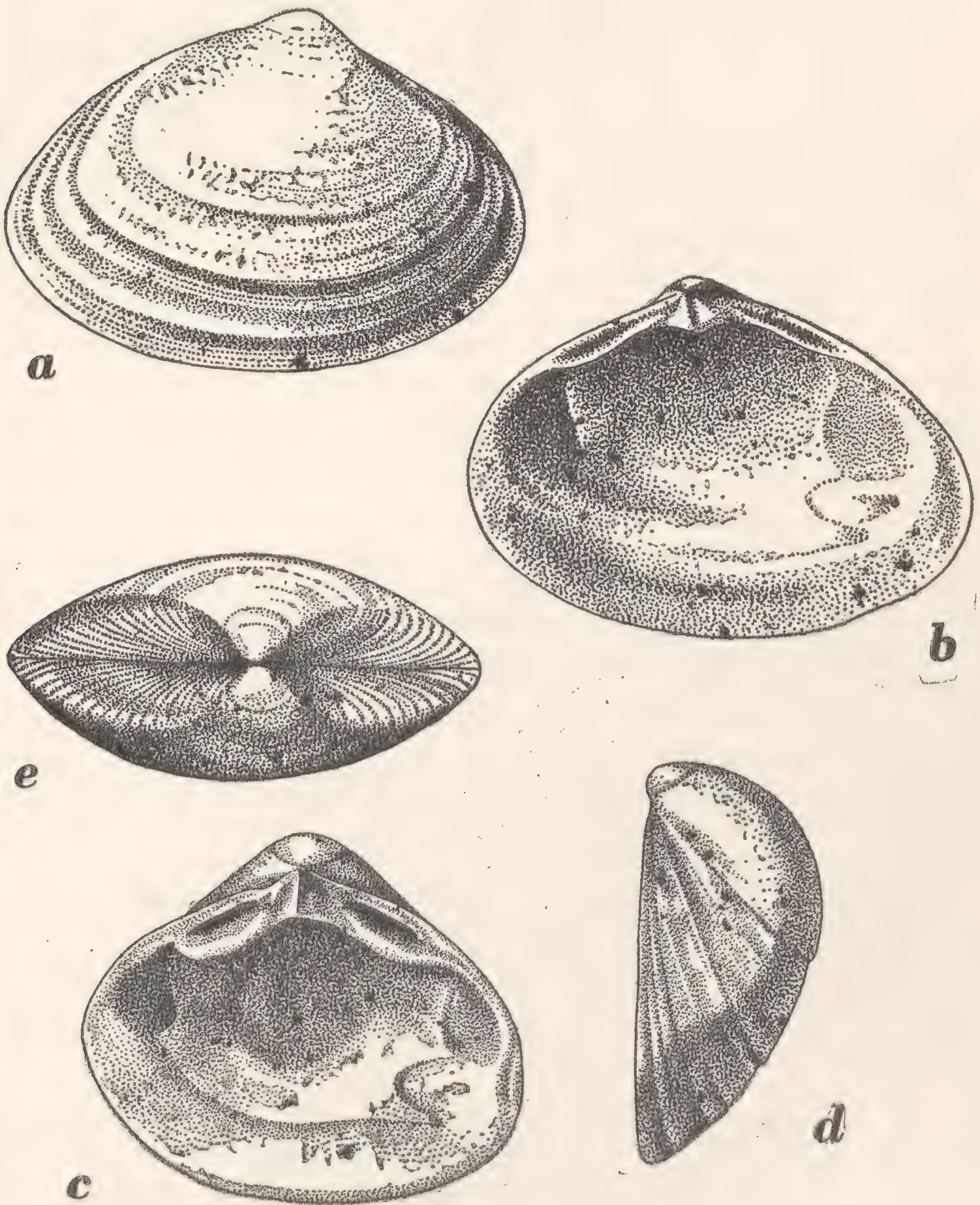


Figure 4. *Spisula subtruncata* (da Costa), x 14.

(a), (b) a flat rather thin form, (c), (d) a heavy, convex form (probably fossil): the groove-pattern had completely disappeared); (e) dorsal aspect showing the characteristic groove-pattern.

GEOGRAPHICAL DISTRIBUTION. *S. elliptica* has a northern distribution, extending from Iceland and Norway through the North Sea into the English Channel. Apparently it does not extend further south, and I have never seen it myself from, for instance, the south coast of Brittany. Round the British Isles it may be found in any locality where conditions are favourable. Its distribution along the English Channel coast is given by Holme (1961, *J. mar. biol. Assoc. U.K.* **41**: 397–461).

3. *Spisula subtruncata* (da Costa)

HINGE. Left valve: the branches of the bifid cardinal tooth reach the lower margin of the hinge-plate; left branch directed $\pm$ N.E.–S.W.; the much thinner fulcrum bordering the ligament-pit lies parallel to it. Right valve: left cardinal tooth $\frac{2}{3}$ to $\frac{3}{4}$ of the length of the thin fulcrum bordering the ligament-pit; the fulcrum directed $\pm$ N.W.–S.E. Ligament-pit occupying about half of the central part of the hinge, not or only slightly concave at the base.

MUSCLE SCARS. Pallial sinus on an average $1\frac{1}{2}$ times as long as the posterior adductor scar, of almost uniform width throughout.

DORSAL AREAS. Grooved with a fan-shaped groove-pattern.

SCULPTURE. There is rather more variation in the sculpture of this species than in that of the preceding two. The surface may be almost entirely covered with concentric striae almost assuming the nature of ribs, while other specimens show only fine concentric striae, which are most pronounced near the ventral and posterior parts of the shell. A few well-marked lines of growth are usually present.

SHAPE. Moderately to strongly inequilateral (asymmetrical), the posterior end being longer than the anterior; otherwise very variable.

DIMENSIONS. About half the size of an adult *S. solida*.

DISTINGUISHING CHARACTERS. The combination of grooved dorsal area with a long (bifid) cardinal tooth in the left valve serves to distinguish this species readily from the other two. Other helpful characters are a straight anterior adductor scar, a rather narrow ligament-pit and a usually short pallial sinus. Also most individuals are much more asymmetrical than the other two species.

VARIABILITY. *S. subtruncata* is certainly the most variable European species of the genus, the following characters being especially involved:

1. The margins, which may be either (*a*) strongly sloping, with an acute umbonal angle, or (*b*) gently sloping, with a more obtuse umbonal angle, thus giving the shell a triangular or a more or less oval outline.

2. The shape, which may be either (*a*) convex with the umbones curved inwards, or (*b*) rather flat with the umbones not curved inwards.

3. The shell may either be (*a*) thick and heavy, or (*b*) rather thin and much lighter; in the former case the hinge is more strongly built.

4. The shell may be either (*a*) almost symmetrical or (*b*) rather strongly asymmetrical.

5. Sculpture—see above.

6. The dorsal areas, which may be (*a*) more or (*b*) less prominent. As to this point, da Costa writes in his original description, "the sides are much flattened, or almost truncated," hence the epithet *subtruncata*.

Variations such as an elongated posterior end or an undulated ventral margin may probably be ascribed to environmental influence. With the exception of item 5, sculpture, all these variations refer to the general shape or outline of the shell, (*a*) and (*b*) being the extremes. The many varieties of *S. subtruncata* which have been described from time to time are all based on some combination of the characters mentioned above. For correct determination of the species, however, one must rely upon the constant features summarized under the heading "distinguishing characters".

GEOGRAPHICAL DISTRIBUTION. *S. subtruncata* is widely distributed from southern Scandinavia to far into the Mediterranean Sea, and is recorded from Algeria and the Canary Islands. The whole North Sea and adjacent waters are included in this area, so the species may be expected anywhere on the British coasts where the conditions for its occurrence are favourable. Forbes & Hanley mention it from Orkney and Shetland.

ACKNOWLEDGMENTS

I am indebted to Mr. H. Heijn for placing his beautiful drawings at my disposal, and to Mr. L. S. Atkins of Cork for reading the text.

REVIEW

Contributions to the knowledge of South African marine Mollusca. K. H. BARNARD. *Annals of the South African Museum*. Part 4. Gastropoda: Prosobranchiata: Rhipidoglossa, Docoglossa, Tectibranchiata. Polyplacophora. Solenogastres. Scaphopoda. Vol. 47, part 2, pp. 201–360, 30 text-figures. December 1963. Price R.2.30.

Part 5. Lamellibranchiata. Vol. 47, part 3, pp. 361–593, 39 text-figures. March 1964. Price R.3.40. Obtainable from the Librarian, South African Museum, Cape Town.

In these two parts of his monograph Dr. Barnard continues the excellent work of those previously issued (see *J. Conch.* **25**: 207). In his discussions he makes very clear the inadvisability of erecting new species from too scanty material, and when he ventures into this field himself does so on the surest grounds, in contrast to W. H. Turton. The synonymy is again invaluable and will go far to clear up obscurities in nomenclature, especially for owners of specimens from older collections. The thoroughness of Dr. Barnard's researches is well shown by the ten pages of reference in part 5 alone. The text-figures are good and bring out clearly the features he wishes to emphasize. A most valuable work.

L. W. STRATTON

(Dr. Keppel Harcourt Barnard died on 22 September 1964.)

ON *VITREA CONTRACTA* (WESTERLUND)

BY J. G. J. KUIPER

(Read before the Society, 17 October 1964)

Most British authors have regarded *Vitrea contracta* (Westerlund) as a variety of *V. crystallina* (Müller) (e.g. Taylor, 1908, 113), or even as being synonymous with Müller's species (e.g. Kennard & Woodward, 1926, 185). It was officially adopted as a distinct species in Ellis (1951, 193), though detailed records of distribution were not available. At the Editor's request the following notes, based on my paper in *Basteria* (Kuiper, 1948), are presented in the hope that they may assist collectors to distinguish between the two species.

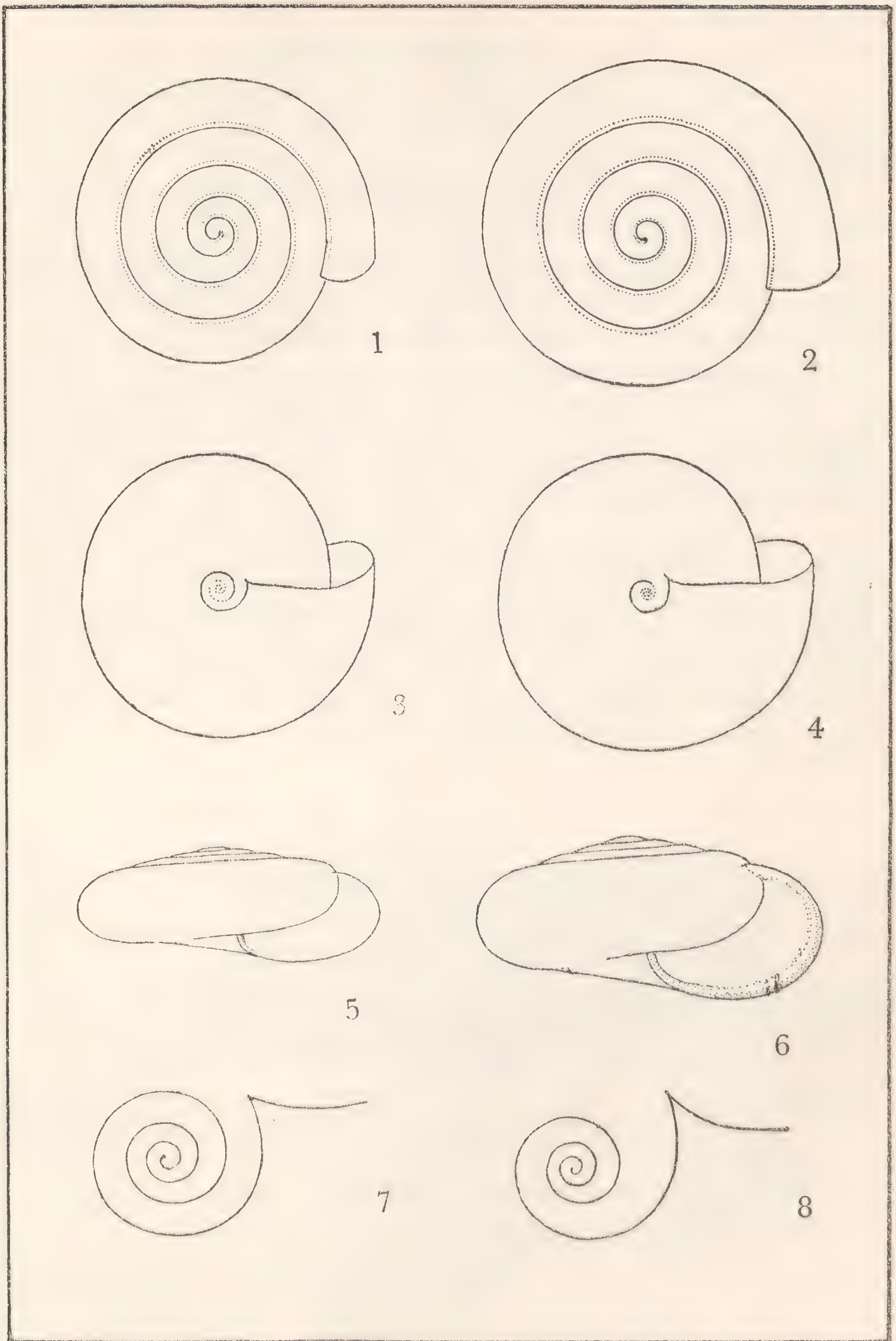
In the Netherlands *V. crystallina* is common throughout the country. It inhabits wet and sodden poor grassland (*Molinetum coeruleae*) mostly used as hayfields, and moist normally intensively cultivated grasslands (*Arrhenatheretum elatioris* and similar communities) for the greater part also used as hayfields; it flourishes on road verges and on dikes or banks on river-clay and loamy soils, and lives also in *Betuleto-Salicetum* fen-woodland on wet peaty soil under mesotrophic conditions (Mörzer Bruyns *et al.*, 1959). Characteristic species of the molluscan association of these kinds of habitats are *Carychium minimum* Müller and *Cochlicopa lubrica* (Müller); in less moist habitats the former is often accompanied by *C. tridentatum* (Risso).

V. contracta is less common in the Netherlands, its range being discontinuous. In habitat it is restricted to eutrophic woodland (*Querceto-Fagetum*) on mostly richer soils (pH 7). Characteristic species of the generally rich malaco-fauna of this type of habitat are *Carychium tridentatum* and *Cochlicopa lubricella* (Stabile).

V. crystallina and *V. contracta* are ecological vicariants, that is they have different ecology but the same geographical range; in some localities in the Netherlands, however, they live in the same habitat. They were first recorded associated together in the Haagse Bos (Wood of the Hague) (Kuiper, 1948), a remnant of the eutrophic forest which formerly covered the greater part of the inner dunes along the North Sea coast, in the provinces of North and South Holland. The molluscan association of this wood, now a public park, includes *Carychium tridentatum* (det. Hugh Watson, 1949) and *Cochlicopa lubricella* (det. H. E. Quick, 1953), with lesser numbers of *Carychium minimum* and *Cochlicopa lubrica*.

The discovery of *V. crystallina* and *V. contracta* living under identical ecological conditions without intermediate forms was further proof of their specific distinctness. The conchological differences between the two species are summarised as follows:

1. SHAPE—the shell of *contracta* is more compressed in the axial sense than that of *crystallina* and the spire is lower (figs. 5 and 6).
2. BODY-WHORL—in *contracta* is one-third wider than the penultimate whorl (fig. 1), in *crystallina* one-half wider (fig. 2), and more



Figures 1, 3, 5, 7. *Vitrea contracta*.

Figures 2, 4, 6, 8. *Vitrea crystallina*.

Figs. 1-6, x13; figs. 7, 8, x 50.

convex beneath.

3. COILING—*contracta* is more closely coiled than *crystallina*.

4. PALATAL RIB—adult shells of *contracta* have no palatal rib; *crystallina* has one or frequently two white palatal ribs inside the aperture (figs. 5 and 6).

5. UMBILICUS—in *contracta* a regular spiral (fig. 7); in *crystallina* an eccentric spiral and narrower (fig. 8).

6. COLOUR—fresh empty shells of *contracta* are milk-white, opaque or subtranslucent (yellowish when the living animal is still within); of *crystallina*, colourless and hyaline, often tinged with green.

7. DIMENSIONS—*crystallina* attains a larger size than *contracta*: the width and height respectively of the largest specimens taken in the Haagse Bos are: *contracta*, 2.52 and 1.25 mm. ($4\frac{1}{2}$ whorls); *crystallina*, 3.2 and 1.65 mm. ($4\frac{3}{4}$ whorls). The number of whorls is measured according to Ehrmann (1933, 21).

The first three of the above points of difference are the most important, enabling even juvenile shells to be distinguished.

Taylor (1908, 116), writing of the geographical distribution of *Hyalinia crystallina*, states that "Dr. Jeffreys found it in the great wood between the Hague and Scheveningen in South Holland." This wood no longer exists, but in a remnant of it along the Scheveningen road about 17 years ago I collected only *V. contracta*.

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MARINE MOLLUSCA AT SPLIT, YUGOSLAVIA

BY JUNE E. CHATFIELD

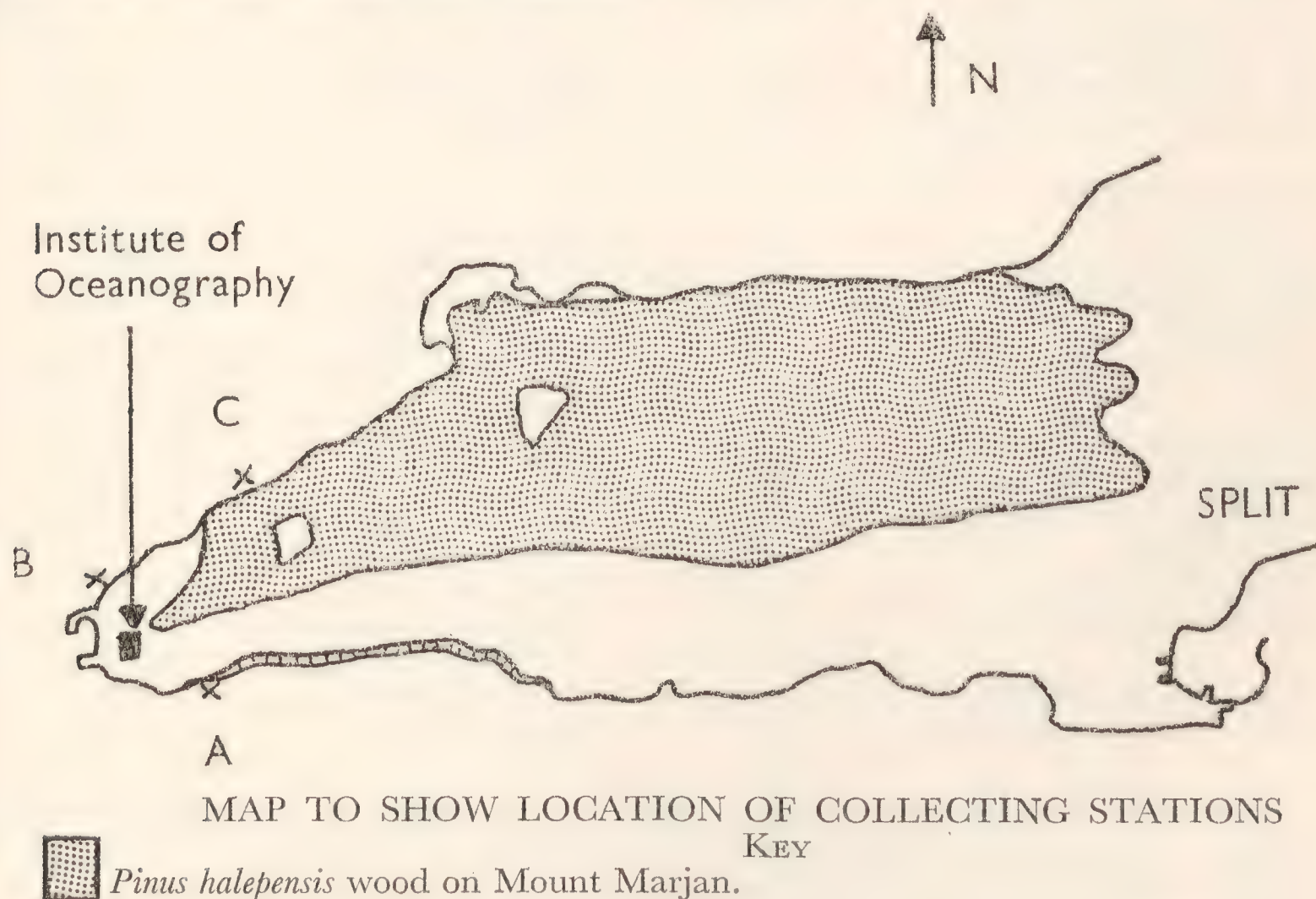
(Read before the Society, 23 May 1964)

During July 1963 a small collection of marine Mollusca was made over the space of ten days around the Institute of Oceanography at Split. The Yugoslavian coast is of limestone rock, which in most cases descends rapidly towards the sea.

The Adriatic, like the Mediterranean, is a calm sea with very slight tides. No actual tide data are available for Split, but the height of the spring tide may be calculated as 12 inches and that of the neap tide as $3\frac{1}{2}$ inches. These figures are approximately correct for most Mediterranean and Adriatic ports. Split is further sheltered by the presence of islands and a peninsula off shore.

The salinity of the Mediterranean is 37–39 p.p.m., which is higher than either the Atlantic (36 p.p.m.) or the north Adriatic, the latter being diluted by fresh water from the land.

The Mediterranean also differs from the Atlantic and Adriatic in having a higher water temperature and a lower annual range in temperature. The average annual range in temperature of the Mediterranean is 9°C . and of the Adriatic is $13\text{--}14^{\circ}\text{C}$.



STATIONS:

(A) Rocky area below cliff; (B) Gently sloping beach below Institute of Oceanography; (C) Steeply sloping rocky beach below pine wood

NOTE—Specimens were collected on the shore at Stations A, B and C, but more collecting was done at A and B than at C

Fig. 1

ANNOTATED LIST OF SPECIES COLLECTED

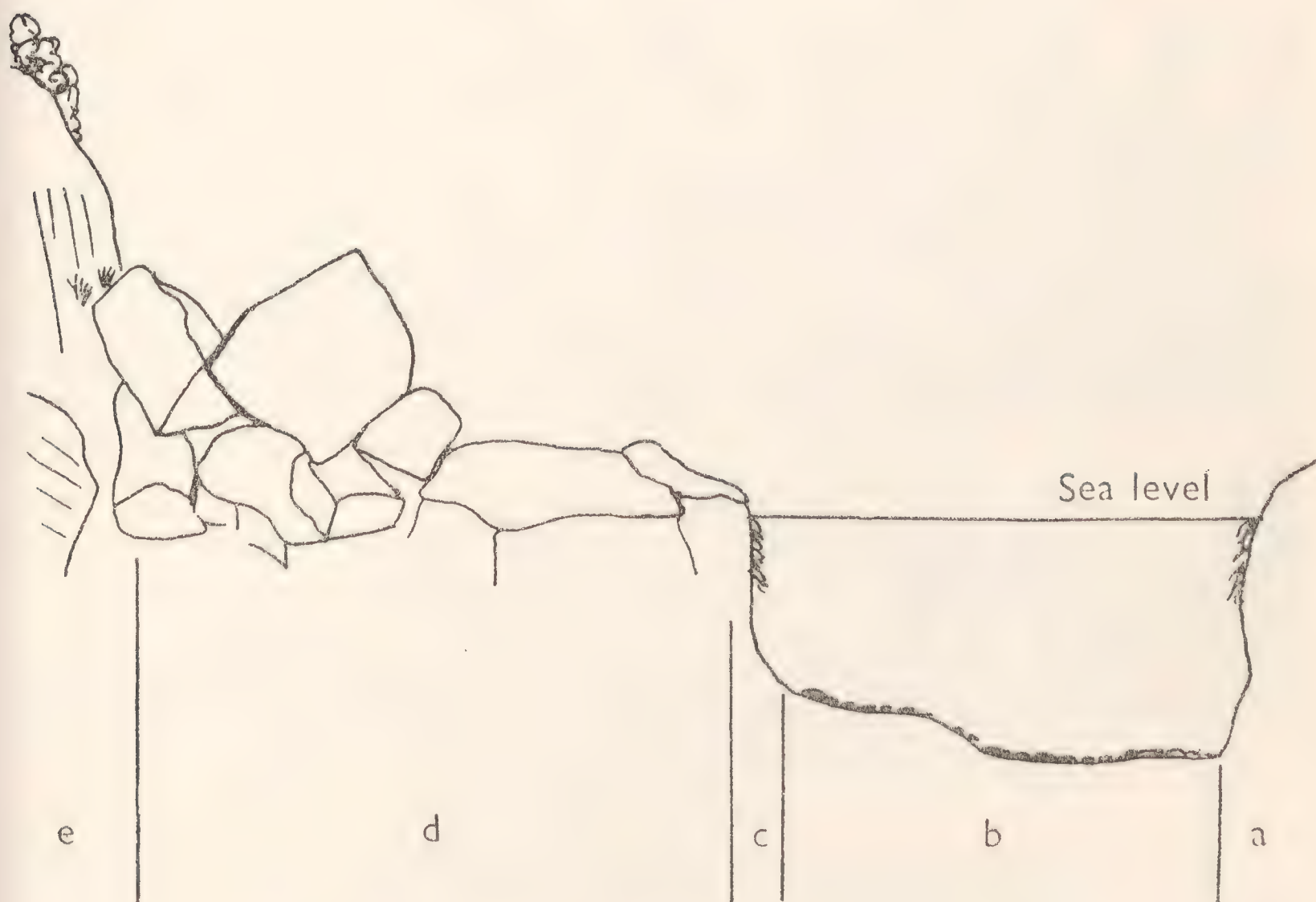
<i>Species</i>	<i>Station</i>	<i>Habitat</i>	<i>Abundance</i>
AMPHINEURA			
<i>Middendorffia caprearum</i> (Scacchi)	A	Living on rock	1
GASTROPODA			
<i>Diodora graeca</i> (L.)	B	Dead on beach	1
<i>Patella caerulea</i> L.	A, B, C	Living on rocks	Frequent
<i>Haliotis lamellosa</i> Lamarck	A		1 dead
<i>Monodonta turbinata</i> (Born)	A, B	Living on rocks	Occasional
<i>M. articulata</i> Lamarck	A, B, C	Living on rocks	Abundant
<i>Gibbula divaricata</i> (L.)	A, B	Living on rocks	Frequent
<i>G. adansonii</i> (Payraudeau)	B	Dead on beach	2
<i>G. villica</i> (Philippi)	B	Living on rocks	Abundant
<i>Rissoa splendida</i> Eichwald	A, B	On algae attached to rocks	Abundant
<i>Alvania cimex</i> (L.)	B	Dead on beach	1
<i>Littorina neritoides</i> (L.)	A, B, C	Rock crevices above water	Abundant living
<i>Aporrhais pespelecani</i> (L.)	B	Dead on beach	1
<i>Cerithium vulgatum</i> Bruguière	A, B	Dead on beach	13
<i>C. rupestre</i> Risso	A	Living on rocks	1
<i>Bittium reticulatum</i> (da Costa)	B	Dead on beach	23
<i>Murex trunculus</i> L.	B	Dead on beach	1
<i>Nassarius incrassatus</i> (Ström)	B	Dead on beach	4
<i>Columbella rustica</i> (L.)	A	Living on rocks	Frequent
<i>Pisania maculosa</i> (Lamarck)	B	Living on rocks	2
<i>Mitra ebenus</i> Lamarck	B	Dead on beach	1
<i>M. tricolor</i> (Gmelin)	B	Dead on beach	1
<i>Conus mediterraneus</i> Bruguière	B	In rocky zone	2 dead
LAMELLIBRANCHIA			
<i>Arca noae</i> L.	B	Dead on beach	7 valves
<i>Barbatia barbata</i> (L.)	B	Dead on beach	2 valves
<i>Mytilus galloprovincialis</i> Lamarck	A, B, C	Attached to rocks by byssus threads	Abundant, living
<i>Lithophaga lithophaga</i> (L.)	B	In burrows in rocks	Abundant, dead
<i>Chlamys distorta</i> (da Costa)	B	Dead on beach	1 valve
<i>Lima lima</i> (L.)	B	Dead on beach	4 valves
<i>Coralliophaga lithophagella</i> (Lamarck)	B	In crevices and burrows in limestone	2 dead
<i>Chama gryphoides</i> L.	B	Dead on beach	1 valve
<i>Venerupis decussatus</i> (L.)	B	Dead shells and dead animal on beach	1 + 3 valves
<i>Timoclea ovata</i> (Pennant)	B	Dead on beach	1 valve
<i>Petricola lithophaga</i> (Retzius)	B	Dead on beach	2 valves

The Adriatic littoral fauna exhibits very little of the zonation of species which is so characteristic of the British shores. This fact is linked with the very reduced tides of the Adriatic and Mediterranean. Although the Adriatic is almost tideless, there is some shore zonation, although the zones are very narrow. Tides are not considered to be the sole cause of shore zonation (Doty, 1957); wind and wave effects are also important. Doty (1957) has pointed out that in an almost tideless sea, water fluctuation due to wind and wave action is probably the major cause of zonation.

The littoral zones on the Adriatic may be difficult to determine as they are so narrow. The terms describing zonation used in this paper are those adopted by Doty (1957, 546).

Representatives of the supralittoral fringe, *Littorina neritoides*, were found at Stations A and C in the crevices of the rocks just above high water level. True supralittoral and littoral Mollusca are able to withstand exposure by the sea. Exposure may generally be considered as interaction between two factors: 1. Battering by wave action: this is not usually applicable in the calm Adriatic. 2. Exposure to the air and to the sun. Tidal movement in the Adriatic is very slight and the Mollusca occurring in the supralittoral rock crevices live out of water, but are periodically sprayed or splashed with sea water as a result of wind and wave action.

An interesting fauna of Mollusca was found associated with the rocks of the littoral and sublittoral fringes. Any tidal or wave effect (and thus zonation) is more noticeable on a gently sloping shore (Station B, Figs. 1 and 3), where water can infiltrate between the rocks, than on a steeper rocky shore or at the bottom of a cliff face (Station A, Figs. 1 and 2).



PROFILE OF BEACH AT STATION A

KEY

(a) Rock off shore; (b) Stony substratum of sublittoral zone; (c) Supralittoral fringe and sublittoral fringe; (d) limestone boulders; (e) limestone cliff with terrestrial plants.

Fig. 2

Nearly all the live collecting was concentrated on the narrow littoral and sublittoral fringes, which suffer far less exposure than the corresponding but much wider zones of the British shores. The sheltered conditions in Split are illustrated by the profusion of epiphytic and epizoic growth on the shells of most of the living Mollusca of the epifauna.

The inhabitants of the rocks may, for convenience, be divided into approximately three categories of ecological habitat:

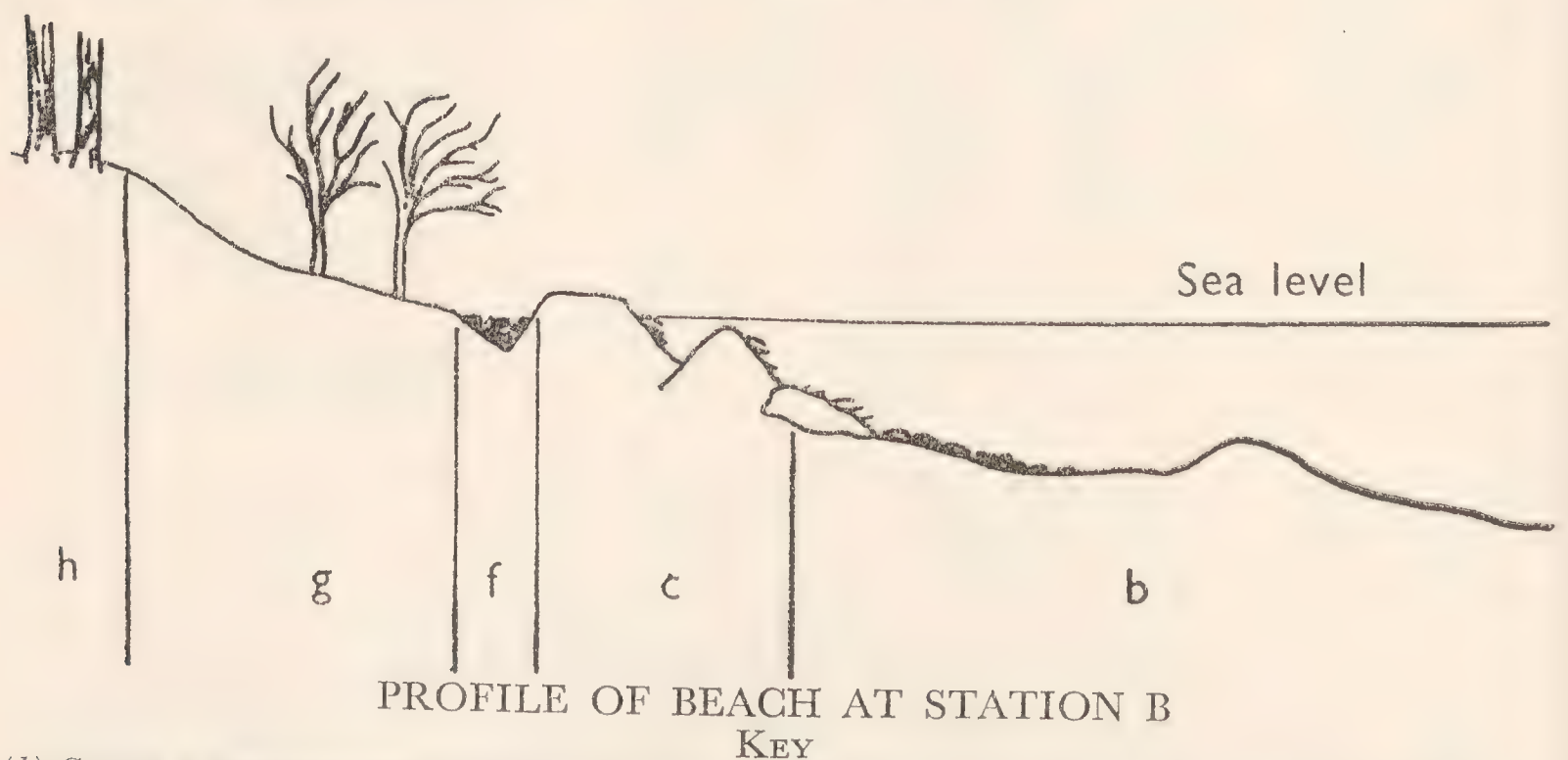
1. Those living in the rocks:
 - (a) Boring their own burrows.
 - (b) Using burrows of other animals or Mollusca.
2. Living on the surface of the rocks (or in algal growth).
3. Living on the bottom or under large pebbles.

Many of the lamellibranchs have become specialised for boring and living in the limestone rock, e.g. *Lithophaga lithophaga*. Others, e.g. *Coralliophaga lithophagella*, do not bore their own burrows but live in the empty burrows of other rock dwellers.

Many Mollusca (mainly gastropods) were found living on the surface and in the crevices of rocks. Marine algae commonly found on the rocks were: *Fucus* sp., *Cystoseira abrotanifolia* C. Ag. and *Padina pavonia* L., the latter in the sublittoral fringe. Many of the Trochacea are probably browsers on the small plant and animal growth on the rock surfaces. Large numbers of some species of the Trochacea were observed; *Monodonta turbinata*, *Gibbula divaricata* and *Gibbula villica* were especially abundant. Representatives of this super-family flourish in sheltered waters.

Patella caerulea occurred abundantly on the rocks. The shell is very flat and the animal difficult to detach without a knife. It would be interesting to know if the flatness of the shell may in any way be correlated with the calmness of the sea in which this species lives.

Mytilus galloprovincialis occurred abundantly in a few habitats where it was attached to the rocks by byssus threads.



- KEY
- (b) Stony substratum of sublittoral zone; (c) Narrow rocky littoral fringe; (f) pebbles;
 (g) Stony soil with tamarisk trees; (h) Pine wood (*Pinus halepensis*)

Fig. 3

Rissoa splendida was found amongst *Cystoseira abrotanifolia* which was growing on the steep faces of the rocks in the supralittoral fringe. This species was found in large numbers in finely divided weed in two of the three stations investigated.

Other species associated with the sublittoral fringe occurred under the numerous flat pebbles and boulders on the bottom.

Species on the sea floor off shore were represented in this small collection only by dead shells collected on the shore.

ECONOMICS

Most of the species of Mollusca encountered are economically unimportant. *Lithophaga lithophaga*, however, is eaten in Split, and *Mytilus galloprovincialis* is also edible.

DISTRIBUTION

Many of the species found were those also to be found in the North Sea and Atlantic in addition to the Mediterranean and Adriatic. Shelter is probably an important factor which limits the distribution of some species to the Mediterranean and Adriatic, but it would be interesting to test this. Salinity and water temperatures may be other influencing factors.

SUMMARY

1. An annotated list of Mollusca collected by the author at Split, Yugoslavia, in July 1963 is given.

2. A few species are discussed with relation to ecology. The effects on zonation of the very slight tides ($3\frac{1}{2}$ inches Neap) and sheltered conditions of the Adriatic are considered.

The ecological study of the Mollusca of the Yugoslavian coast of the Adriatic is very interesting, but complex. It is impossible in ten days to obtain much information on species occurrence and ecology, but further work on the subject, of a more quantitative type, would undoubtedly bring useful results.

ACKNOWLEDGMENTS

I am grateful to the Revd. H. E. J. Biggs and to Mr. D. Heppell for reading and commenting on the typescript. Thanks are also due to Dr. A. M. Keen for discussion on zonation; to Mr. J. H. Price for the identification of the algae; to the Institute of Oceanography at Split for their friendly co-operation and to my colleagues from Imperial College, London who assisted in the collecting of material.

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CECILIOIDES ACICULA (MULLER) AS A GARDEN SNAIL

BY L. W. STRATTON

(Read before the Society, 17 October 1964)

In July 1964 Mr. G. C. Grindley, of Harpenden, Hertfordshire, noticed that his young Brassica plants were wilting and on investigation found a number of what he termed "bugs" at the roots. These, together with some of the plants, he took to Rothamsted Experimental Station, where Mr. Peter Newell examined the plants and expressed the opinion that they were suffering from drought. The so-called "bugs" proved to be minute snails, all very active, which he sent to me, when I was able to confirm his determination that they were *Ceciloides acicula* (Müller).

In early September Mr. Grindley sent more snails with the following particulars: "The snails are in close association with the fibrous roots and peat surrounding them—as in planting I threw a handful of wet peat in each hole. Soon after planting out, the roots were found damaged by small black slugs. The first plantings were badly damaged by these pests and a second planting had to be made. The snails are found chiefly where the plants are debilitated by slug attack and drought, in numbers varying from 2 to 6 or 7 at each plant. They are not found in the vacant spaces."

L. E. Adams (*J. Conch.* 9: 297) suggests that *C. acicula* feeds on roots. Mr. A. E. Ellis is of the opinion that it is sarcophilous, being so abundant amongst bones in old graves; Gray (1840, 192) refers to its presence in Saxon coffins. Tate (1866, 173) states that "It is inferred, because *A. acicula* lives underground, and has rarely been observed on the surface in a living state, that it feeds upon animal matter." Jeffreys (1862, 296) writes, "In all probability the *A. acicula* lives upon animal matter; for, in the spots where it has been found living, no underground fungus or other vegetation appears to exist, and the form of the shell would induce a belief that this snail is not only zoophagous but predaceous", comparing it with *Glandina*, etc. He further states (p. 298) that Nilsson "supposed that the *A. acicula* fed on the tender and juicy fibrils of the roots of grass. Mr. Pickering informed me that a considerable number of live specimens were once procured by a gentleman in Hertfordshire, while digging up potatoes. His friend, not being a conchologist, thought at first that they were little white maggots."

All this gives rise to a number of queries: how did *C. acicula* get into this garden; was it there originally or introduced with peat; why was it only around the plants? Probably the watering of the plants provided a damp environment where the snails (and also the slugs) could remain active and feed. Was it feeding on rootlets, or peat, or on some organisms or animal remains in the soil, or on the slugs? Another question: does this snail habitually inhabit garden soil but has been overlooked? It is a coincidence that two records from gardens, over a century apart, are both from Hertfordshire.

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ARION LUSITANICUS MABILLE IN CORNWALL

BY A. E. ELLIS

(Read before the Society, 17 October 1964)

A fortnight's holiday spent at Cape Cornwall, St. Just-in-Penwith, West Cornwall, in August 1964 afforded an opportunity of listing the non-marine Mollusca for the 10 km. square S.W. (10) 33, for which the Recorder had no records. Three-quarters of this area is sea (engendering a sense of grievance at having to pay the full price for the Ordnance Survey 2½ inch map), while such land as there is consists mostly of granite moors and farmland uncongenial for snails, with two or three swift stony brooks. A total of 28 species were found, all Gastropoda: 2 freshwater (*Potamopyrgus jenkinsi* and *Ancylus fluviatilis*), 16 land snails and 10 slugs. Of the last, the most ubiquitous in these parts is *Agriolimax caruanae* Pollonera, which turns up everywhere in both wild and cultivated places, even on the cliffs nearly down to high tide mark and in wet places where *A. laevis* (which was not found) would be expected. The most interesting find, however, was *Arion lusitanicus*, which occurs in numbers in the kitchen gardens of Porthledden Hotel and Nanpean Farm (National Grid SW/357317), and was seen also in a cabbage field at Bosorne (364308). At Nanpean the associated species were *Milax gagates* (Draparnaud), *M. sowerbyi* (Férussac), *Agriolimax reticulatus* (Müller), *A. caruanae* and *Limax marginatus* (Müller), an exceptional assortment. The Arions struck one at first sight as being different from *A. ater* (L.), which is common in pasture fields and on the cliffs. The colour is variable, ranging from reddish orange through brown to smoky grey and black, the dorsal region usually being paler than the sides and having a rusty appearance, owing to persistence of the orange pigmentation of the juvenile on the dorsal rugae, and the lateral brown bands are often discernible in maturity. The lineolations of the foot-fringe do not extend to the sole. The young are mostly orange with conspicuous lateral brown bands and resemble *A. subfuscus*, though the dorsal rugae are sharper and more prominent; they darken rapidly when about one-third grown. Some of the adults are only distinguishable from *A. ater* or *A. rufus* by the genitalia, which are just as depicted by Quick (1952, figs. 1, 5; 1960, fig. 5, A, E), except for the absence of black pigment. It is almost as though this slug started life as *subfuscus* (which it resembles in the genitalia) and later metamorphosed into *ater* or *rufus*. Living slugs and dissections were sent to Dr. Quick, who agrees with the determination. It is probable that

A. lusitanicus is not an uncommon slug in West Cornwall; it was not seen in wild habitats, where *A. ater* is common and much in evidence in the evening and after rain.

Mrs. S. M. Turk has found *lusitanicus* at Reskadinnick, which was large, bandless and resembled *rufus* in appearance, and also in the Isles of Scilly: this latter was smaller, with well marked banding, and heavy black pigmentation of the free oviduct and epiphallus. She found it also by the R. Hayle near St. Erth.

A. lusitanicus has been recorded in the British Isles from Castletown Berehaven, Co. Cork; Durham; Attleborough, Warwickshire; and Bangor, Caernarvonshire; it must, however, be far more frequent than these few records indicate. It is possible that some people are deterred from the study of slugs by the necessity for dissection in order to establish the identity of certain species. In the case of the larger kinds, however, this presents little difficulty. The critical features of the genitalia can readily be made out with the naked eye or a low power magnifying glass, and compared with Quick's admirable figures. Large Arions resembling *ater*, especially if not jet black, occurring in gardens or cultivated fields are suspect and should be dissected.

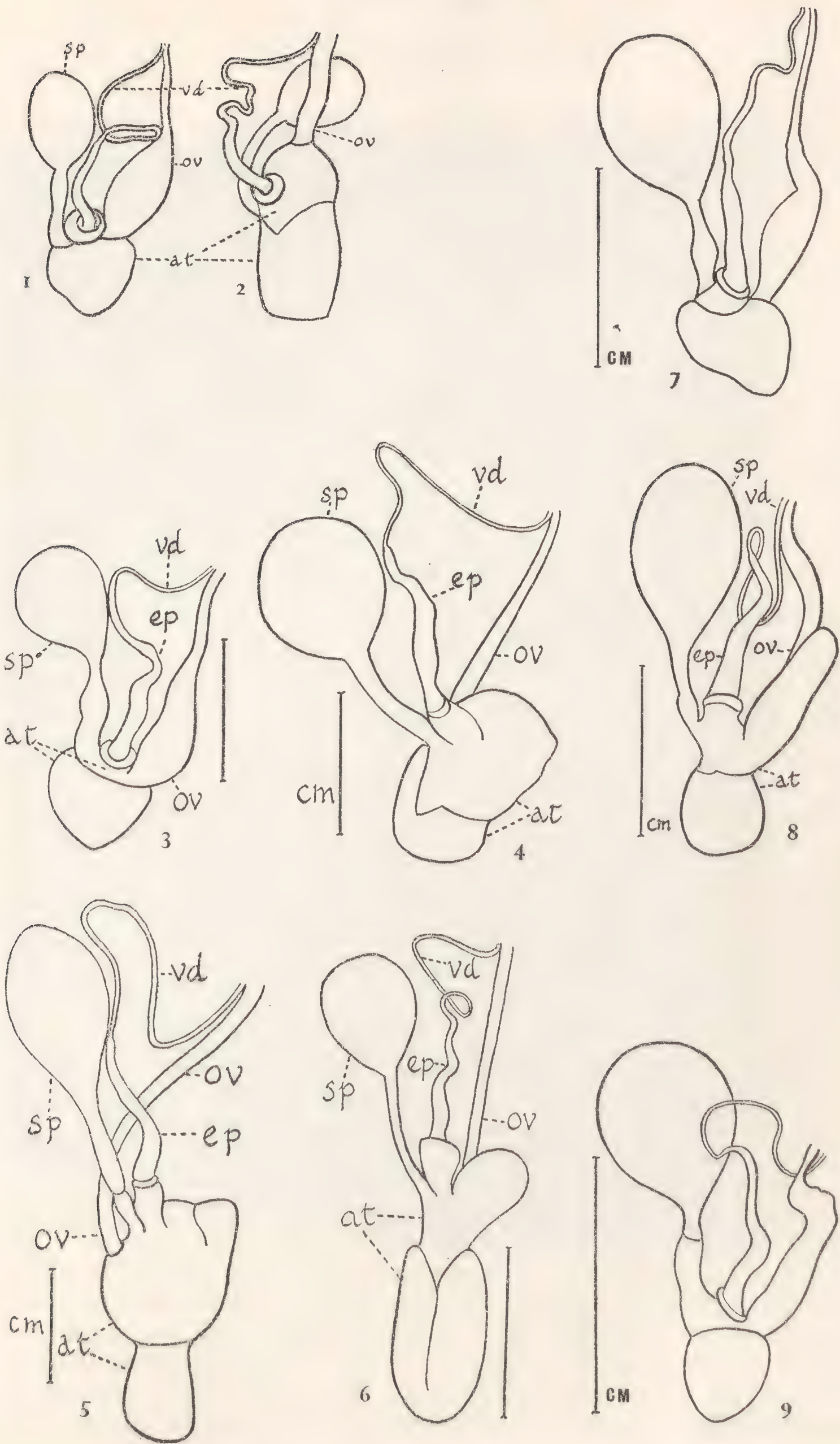
The best diagnostic characters are to be seen in the distal or anterior genitalia, particularly the eversible atrium and free portion of the oviduct. In both *ater* and *rufus* the atrium is large, the upper (proximal or posterior) section containing a complex fold of the lining known as the ligula, while the oviduct is not dilated. In *rufus* the upper atrium is greatly enlarged (to a zoologist recalling the gizzard of an earthworm), with a big bulge on the left side which accommodates the large ligula; the oviduct enters the upper atrium on the right side, even in front of the spermatheca duct. In *lusitanicus* the atrium is small and rounded, the upper section rudimentary, without a ligula, while the distal or anterior end of the oviduct is dilated and contains a pair of wrinkled folds which are analogous to the atrial ligula of the other two species; in this respect it resembles *A. subfuscus* and *A. hortensis* rather than *A. ater* or *A. rufus*. A dilatation about the middle of the rather short spermatheca duct seems also to be a characteristic feature.

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TEXT FIGURES

Dissections of the distal genitalia of *Arion*: *at*, genital atrium; *ep*, epiphallus; *ov*, oviduct; *sp*, spermatheca; *vd*, vas deferens (sperm duct). 1, 3, 7. *A. lusitanicus*, St. Just, Cornwall. 2. *A. ater* (after Quick). 4 & 5. *A. rufus*, Wallington, Surrey. 6. *A. ater*, Harpenden, Hertfordshire, J. W. Stephenson. 8. *A. lusitanicus*, Alphington, Devon. 9. *A. subfuscus*, Wadebridge, Cornwall, Mrs. S. M. Turk.



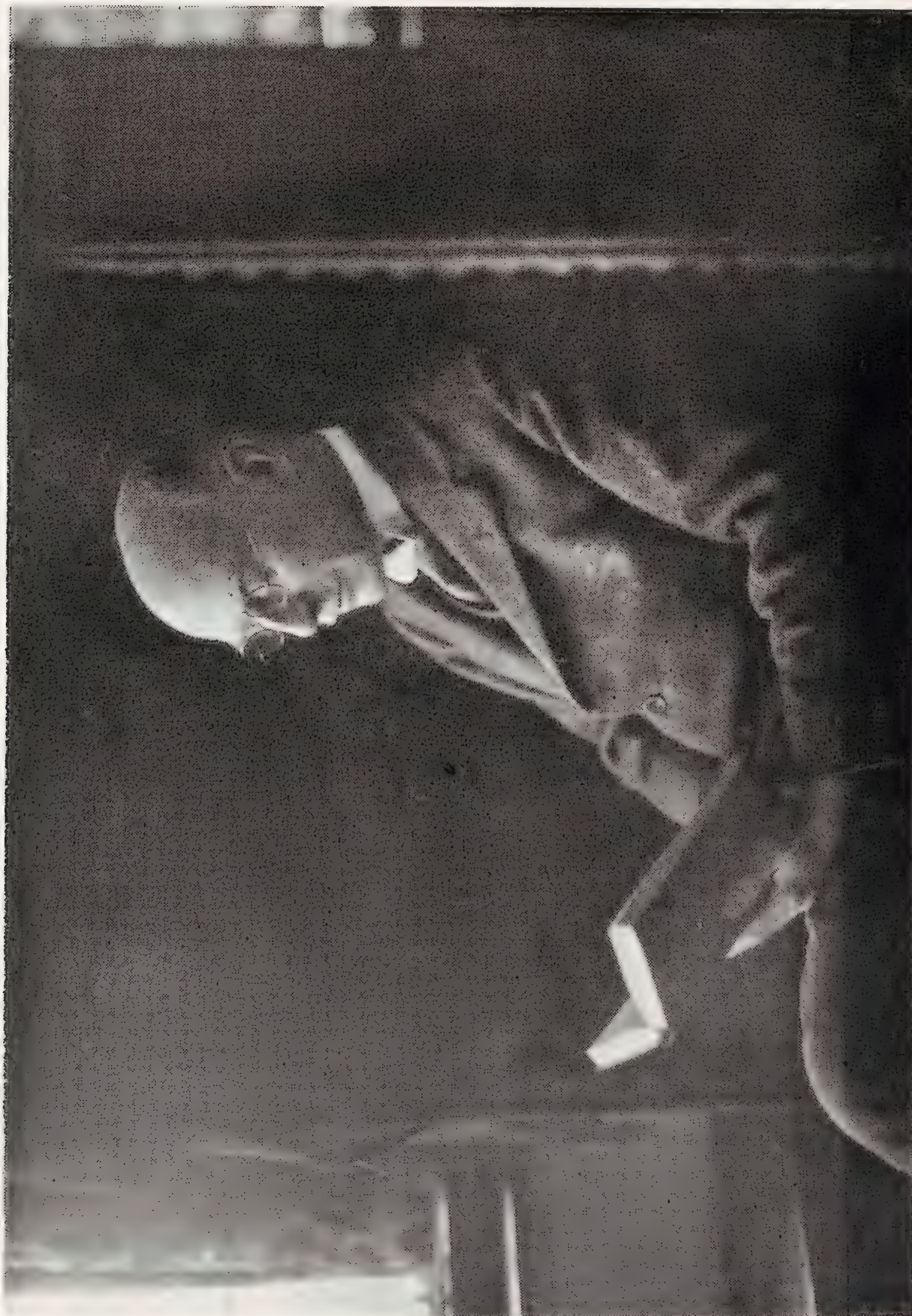
OBITUARY

F. F. LAIDLAW, 1876-1963

Frank Fortescue Laidlaw was born at Galashiels on 1 February 1876 and died in his sleep on 11 December 1963. He spent his childhood at Guildford and was educated at Uppingham, from where he went to Trinity College, Cambridge, and took a "double first" in Zoology. In 1899 he joined the Cambridge University Expedition to Malaya, under the leadership of W. W. Skeat, returning to England in the following year. He was then appointed Lecturer and Assistant Demonstrator in Zoology at Owen's College, Manchester. In 1903 he turned to the study of medicine and qualified M.R.C.S. and L.R.C.P. from St. Bartholomew's Hospital, London, in 1909. In 1911 he took a practice at Uffculme, Devon, where he remained, except for three years in the R.A.M.C. in the first World War, until his retirement in 1945. Shortly after taking up his practice he married Maud Wright, who, together with their son and two daughters, survives him. After his retirement Laidlaw lived successively at Woodham Mortimer, Essex, St. Lawrence, Isle of Wight, and Foxearth, Suffolk.

From early childhood Laidlaw's interests were many, but natural history was his first love and he was equally at home in botany and zoology. His participation in the Skeat Expedition gave him scope for his varied talents as student and field collector, for he was obliged to cover several widely different groups of animals. Many years later he wrote a reminiscent account of his experiences on this expedition (Travels in Kelantan, Trengganu and Upper Perak, a personal narrative. *J. Malayan Br. Asiat. Soc.* **26**, part 4: 148-164 (1953)). The Malayan adventure made a deep impression on him and was the origin of his lifelong interest in the natural history of the region. He reported on the dragonflies, marine turbellarians, amphibians and reptiles collected on the expedition. The systematics of dragonflies and polyclad flatworms was advanced considerably by his studies and he maintained a keen interest in these groups all his life.

Laidlaw left the reports on Mollusca to others who were then interested in the molluscan fauna of that region, chief among them E. R. Sykes and W. E. Collinge. Nearly thirty years later he published a list of the non-marine Mollusca of the Malay Peninsula (1928). His interest in Mollusca was not a later development, however, for he was elected a member of the Conchological Society in 1900 and published his first malacological note in the *Journal of Conchology* in 1908. Except for this note and one on the land shells of Lugano (1929a), the outcome of a holiday spent there, the rest of his papers on Mollusca dealt exclusively with the non-marine fauna of the Malay Archipelago. Although his published output was not large it was sound and revealed the quality of the keen intellect which he brought to bear on all scientific problems. His early studies on the Ario-phantiidae (1932b, 1938), the Dyakiinae (1931c) and the anomalous slug



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Atopos (1940a) are particularly impressive. He described a number of new species and subspecies and proposed several new genera.

Laidlaw's favourite molluscan genus was undoubtedly *Amphidromus*. The beauty and variety of the colours exhibited by the many species of this genus had always exercised a strong fascination over him and through the years he had gathered together a large collection of them. It was not until after he had sold this collection to the Chicago Natural History Museum that he decided to write a comprehensive account of the genus in which he could present his ideas on the relationships of its component species, their specific boundaries and their evolution. As his advanced age did not allow him to complete this work himself, it is fortunate that he had the able assistance of Dr. Alan Solem of the Chicago Natural History Museum. Together they published a large "Synoptic Catalogue" of the genus *Amphidromus* (1961) (reviewed in this *Journal*, 25: 87). The publication of this work on Dr. and Mrs. Laidlaw's golden wedding day was thoughtfully arranged by Dr. Solem and gave them unique pleasure.

It may be pointed out that between 1911 and 1945 all his researches on natural history were done during such spare time as he could find from his work as a general practitioner. Recognized by his professional colleagues as a man of high ability, to his patients he was known for his outstanding kindness, humanity and good humour, and he played a full part in the life of the parish in which he lived.

Laidlaw was an expert on the flora of Ben Lawers, which he had climbed about fifty times, often carrying a full-plate camera weighing over twenty pounds. He was the first to discover the wintergreen (*Pyrola minor*) in Devon and, after his retirement, he rediscovered the Isle of Wight Helleborine (*Epipactis vectensis*) which had not been reported from the island since its first discovery in 1917. He was a member of the Malacological Society of London, the Royal Entomological Society and the Zoological Society of London. For his services to Malayan natural history he was elected a corresponding member of the Malayan Branch of the Royal Asiatic Society in 1920. The accompanying photograph, taken about 30 years ago, he considered was a good likeness, but it conveys little of his inner character. Helpful, modest, gentle and completely unprejudiced in thought and deed, he made a charming companion, an entertaining conversationalist and a delightful correspondent. I am most grateful to Dr. E. F. Laidlaw for supplying much information about his father.

S. P. DANCE

NEW MOLLUSCAN TAXA PUBLISHED BY F. F. LAIDLAW

The following is believed to be a complete list of the new molluscan taxa published by Laidlaw. It is correlated with the bibliography which follows:

acme, *Diplommatina*, n.sp., 1949, 212.

alticola, *Lagochilus*, n.sp., 1937, 187.

attenuata, *Diplommatina*, n. sp., 1949, 210.

babiensis, *Amphidromus webbi*, n. subsp., 1954, 76.

- babiensis**, *Cyclohelix kibleri*, n. subsp., 1957, 130.
Baiaplecta nom. nov. [pro *Pangania* Laidlaw 1932b, non Poppius 1914 (Insecta: Hemiptera)], 1956.
brevior, *Diplommatina superba*, n. subsp., 1949, 210.
butoti, *Amphidromus perversus*, n. subsp., 1961, 535.
Colparion n. gen., (Type species *Colparion madgei* Laidlaw n. sp.), 1938.
corrugata, *Everettia*, n. sp., 1937, 179.
degneri, *Pupina* (*Tylotoechus*), n. sp., 1957, 131.
demorgani, *Diplommatina*, n. sp., 1949, 207.
doveri, *Parmarion* (*Wiegmannia*), n. sp., 1929b, 260.
fruhstorferi, *Amphidromus enganoensis*, nom. nov. [pro *Amphidromus enganoensis gracilior* Fruhstorfer 1905, non *Amphidromus maculiferus gracilior* Fulton 1896], 1954.
fultoni, *Amphidromus*, n. sp., 1929b, 262 (see **fultonianus**, *Amphidromus*, nom. nov., 1930).
fultonianus, *Amphidromus*, nom. nov. [pro *Amphidromus fultoni* Laidlaw 1929b, non Ancey 1897], 1930.
godwinausteni, *Dyakia*, n. sp., 1931c, 191.
jacobsoni, *Amphidromus* (*Syndromus*) *sumatranus*, n. forma, 1954, 80.
jacobsoni, *Cyclohelix crocata*, n. subsp., 1957, 128.
Kalamantania n. gen. (Type species *Helicarion* (?) *whiteheadi* Godwin-Austen 1891), 1931c.
koperbergi, *Amphidromus inversus*, n. subsp., 1961, 561.
macalpinewoodsii, *Rhiostoma*, n. sp., 1939.
madgei, *Colparion*, n. sp., 1938, 9.
maduana, *Diplommatina*, n. sp., 1949, 209.
nummus, *Odontartemon* (*Discartemon*), n. sp., 1929b, 259.
orites, *Clausilia*, n. sp., 1931a.
pahangensis, *Clausilia*, n. sp., 1929b, 262.
Pangania n. gen. (Type species *Helicarion lowi* de Morgan 1885) [see **Baiaplecta** nom. nov., 1956], 1932b, 81.
parabates, *Diplommatina*, n. sp., 1949, 210.
peilei, *Parmarion*, n. sp., 1933, 224.
pentaechma, *Diplommatina*, n. sp., 1949, 207.
planata, *Sarika*, n. sp., 1933, 218.
Platycochlium n. gen. (Type species *Platycochlium sarawakense* Laidlaw n. sp.), 1950b.
Pseudoplecta n. gen. (Type species *Rotula bijuga* Stoliczka 1873), 1932b, 91.
Rasama nom. nov. [pro *Sarama* Godwin-Austen 1908, non Moore 1888 (Insecta: Lepidoptera)], 1932a.
sarawakense, *Platycochlium*, n. sp., 1950b, 370.
schepmani, *Cyclophorus* (*Glossostylus*), n. sp., 1957, 126.
seimundi, *Diplommatina* (*Sinica*), n. sp., 1932c, 37.
sericea, *Philalanka*, n. sp., 1932c, 41.
simalurensis, *Amphidromus webbi*, n. subsp., 1954, 78.
simalurensis, *Cyclohelix kibleri*, n. subsp., 1957, 130.
simalurensis, *Hemiplecta*, n. sp., 1957, 133.
streptophora, *Diplommatina*, n. sp., 1949, 205.
tweediei, *Diplommatina*, n. sp., 1949, 213.
unicolor, *Cyclophorus* (*Salpingophorus*) *perdix*, n. var., 1928, 29.
uniforme, *Meghimatium*, n. sp., 1937, 177.

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 1928. A list of the land and fresh-water Mollusca of the Malay Peninsula with notes. *J. Malayan Branch Asiat. Soc.* **6**: 25-37.
 1929a. Land Mollusca of Lugano. *J. Conch.* **18**: 344-348.
 1929b. Descriptions of new land molluscs from the Malay Peninsula. *Proc. malac. Soc. Lond.* **18**: 259-263.
 1930. *Amphidromus fultoni* Laidlaw. *Proc. malac. Soc. Lond.* **19**: 16.
 1931a. Description of a new *Clausilia* from Pahang. *J. Conch.* **19**: 163.
 1931b. Note on *Ariophanta* (*Microcystis*) *normani* Smith from Christmas Island. *Proc. malac. Soc. Lond.* **19**: 176.

- 1931c. On a new subfamily Dyakiinae. *Proc. malac. Soc. Lond.* **19**: 190-201.
- 1932a. New name for *Sarama* G.-A. *J. Conch.* **19**: 259.
- 1932b. Notes on Ariophantidae from the Malay Peninsula, with descriptions of new genera. *Proc. malac. Soc. Lond.* **20**: 80-94, text figs.
- 1932c. Notes on the land Mollusca of the Batu Caves, Selangor, with descriptions of two new species. *Bull. Raffles Mus. Singapore* **7**: 35-41, text figs.
1933. A list of the land and fresh-water Mollusca of the Malay Peninsula. Land Mollusca pt. II, Pulmonata. *J. Malayan Branch Asiat. Soc.* **11**: 211-234.
1935. Notes on a collection of terrestrial Mollusca from Christmas Island. *Bull. Raffles Mus. Singapore* **10**: 95-100, text figs.
1937. Notes on land Mollusca from Mount Kinabalu, British North Borneo. *Bull. Raffles Mus. Singapore* **13**: 177-189, text figs.
1938. A new genus and species of the Ariophantidae from the Island of Rodriguez. *Bull. Mauritius Inst.* **1**: 9-12, 1 pl., text fig.
1939. A new *Rhiostoma* from Malaya. *J. Conch.* **21**: 166, text figs.
- 1940a. Notes on some specimens of the genus *Atopos* (Mollusca Pulmonata) with microphotographs illustrating points in the anatomy of the genus. *Bull. Raffles Mus. Singapore* **16**: 121-132, 3 pls.
- 1940b. A note on the occurrence of *Parafossarulus striatulus* (Bens.) in the Malay Peninsula. *Bull. Raffles Mus. Singapore* **16**: 133.
1941. *Rhiostoma macalpine-woodsii* Laidlaw. *J. Conch.* **21**: 245.
1949. The Malayan species of *Diplommatina* (Cyclophoridae). *Bull. Raffles Mus. Singapore* **19**: 199-215, text figs.
- 1950a. A list of the species referred to the genus *Diplommatina* (Mollusca, Prosobranchia, Cyclophoridae) recorded from Borneo. *Bull. Raffles Mus. Singapore* **23**: 212-229, text figs.
- 1950b. Description of a new genus of land-mollusc, belonging to the family Strep-taxidae, from the Bau district of Sarawak. *Sarawak Mus. J.* **5**: 370-372, fig.
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1956. *Baiaplecta* n. nom. *Arch. Moll.* **85**: 83.
1957. Notes on the collection of Land-Mollusca made by Dr. E. Jacobson on the islands of Simalur and Babi in 1913, with descriptions of new species and races. *Zool. Meded.* **35**: 125-138, figs.
1961. (with A. Solem). The land snail genus *Amphidromus* a synoptic catalogue. *Fieldiana: Zool.* **41**: 505-677, text figs.
- 1963a. Notes on the genus *Dyakia*, with a list of the species. *J. Conch.* **25**: 137-150, 1 pl.
- 1963b. Addendum [to 1963a]. *J. Conch.* **25**: 220.

L. W. GRENSTED, 1884-1964

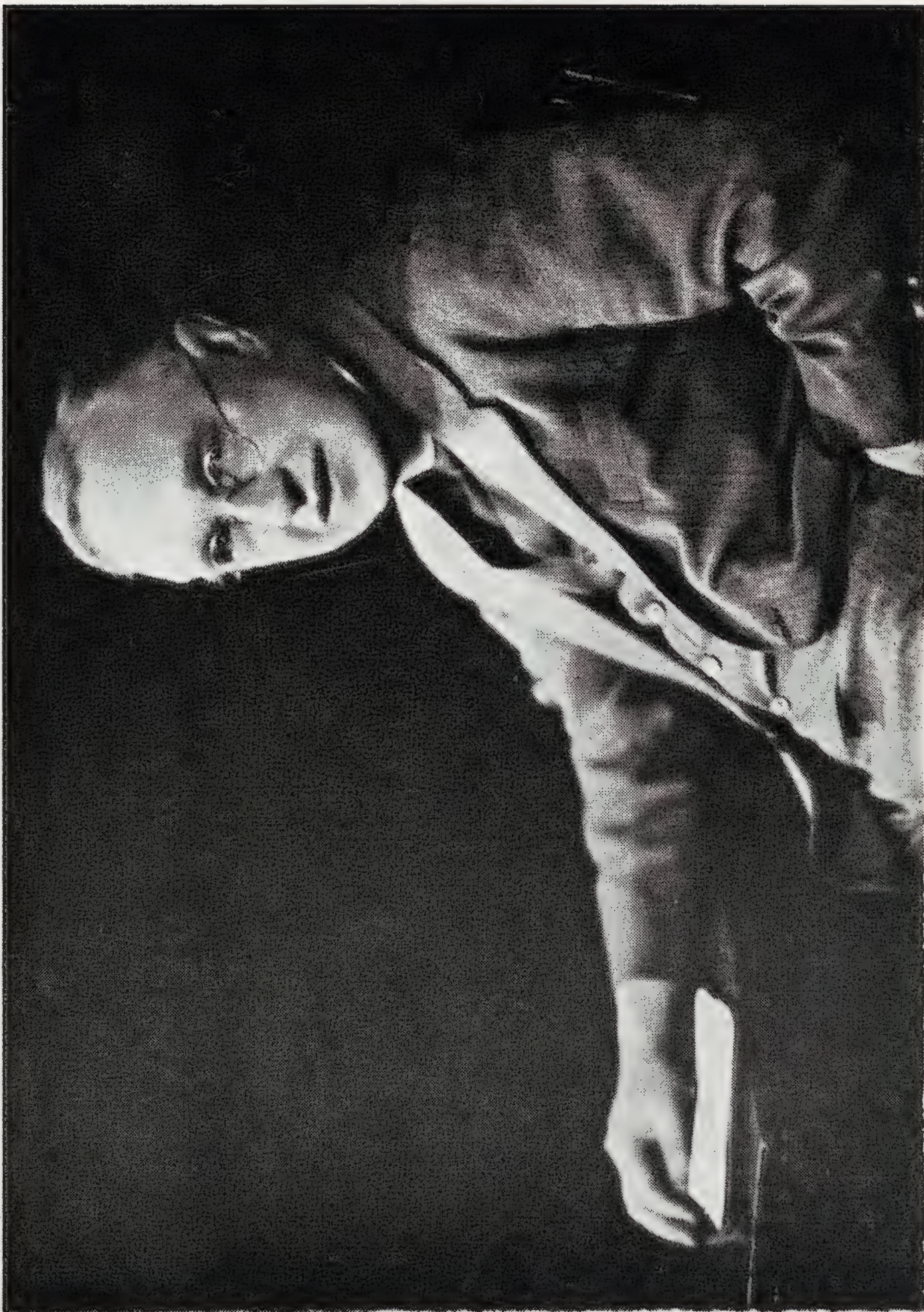
Laurence William Grensted was born on 6 December 1884 at Blundellsands, Lancashire, and died on 18 March 1964 at his home in Cirencester. He was the son of the Revd. Canon F. F. Grensted, school inspector in the diocese of Liverpool. He was educated at Merchant Taylors' School, Crosby, and at University College, Oxford, where he was elected to a scholarship in mathematics in 1903. He obtained a first class in Mathematical Moderations and a second in the final Honours School of Mathematics, after which he read Literae Humaniores and took a second in "Greats". He was Aubrey Moore Student in 1908, when he went to Egerton Hall, Manchester, of which he became Vice-Principal in 1910 and Principal in 1919, besides

being Lecturer in History of Doctrine at Manchester University. From 1915 to 1919 he served as temporary chaplain to the forces. Grensted held the degrees of M.A. and D.D. of Oxford and B.D. of Manchester; he was ordained deacon in 1910 and priest a year later.

He returned to Oxford in 1924 as Fellow, Chaplain and Praelector of his old college, and was appointed University Lecturer in Psychology of Religion in 1928. His appointment two years later as Nolloth Professor of Philosophy of the Christian Religion entailed a fellowship at Oriel College, where he remained for the next twenty years, on retirement becoming Fellow and Professor Emeritus. Amongst Grensted's other offices and appointments were: examiner in the Honours School of Theology; Bampton Lecturer; Hulsean Preacher and Lecturer in Pastoral Theology at Cambridge, 1932; Canon Theologian of Liverpool, 1930-42, then Canon Emeritus; Fellow of St. Michael's College, Tenbury; examining chaplain at various periods to the bishops of Hereford, Manchester, Rochester and Gloucester and to the Archbishop of York. He was chairman of the Anglican Fellowship, 1922-27, and a member of the Archbishop's Commissions on Doctrine, Ministry of Women, Divine Healing, and Spiritualism, and of the Archbishop's Committee of Doctors and Clergy. He was a Fellow of the British Psychological Society and a member of the Society for Psychical Research. After his retirement he became chairman of the Cirencester Historical and Archaeological Society and Natural History Society. For some years he acted as referee to the International Commission on Zoological Nomenclature on questions involving classical scholarship. His masterly articles on nomenclature in the *Entomologist's Monthly Magazine* are of universal application and should be studied by all taxonomists. Grensted was the author of about a dozen theological works, his special field being the application of psychology to religion.

In addition to his distinguished professional career as scholar and theologian, Grensted contrived to find time for other activities, of which the principal were entomology and conchology. He was a Fellow of the Royal Entomological Society, and an editor of the *Entomologist's Monthly Magazine* from 1945 until his death in its centenary year. His special groups were Trichoptera and Diptera, with a good general knowledge of Coleoptera, and he was entirely responsible for the identification and arrangement of the caddis-flies in the Hope Department of Entomology at Oxford.

Grensted's interest in conchology was first aroused by being given a box of shells to play with when a small boy. He was fortunate in having a father who encouraged him in all manner of scientific interests. He was responsible for the exhibit of local Mollusca in Oxford University Museum, where his own collection, which included both marine and non-marine shells, has been deposited. He did not publish a great deal on Mollusca: nine notes or short papers appeared in the *Journal of Conchology* between 1924 and 1956, but his most noteworthy contributions to conchological literature were the sections dealing with Mollusca in the *Natural History of the Oxford District* (1926)



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and the *Victoria History of the County of Oxford*, Vol. 1 (1939). To within a few days of his sudden death he was communicating records to the Recorder for the 10 km. Grid Census.

"The Revd. Canon Professor Grensted, Doctor of Divinity", invokes the image of a rather formidable and unapproachable personage, but the precise contrary was true of this kind, simple and humble man. I was fortunate in being still at Oxford when he returned there from Manchester; somehow he got to know that an obscure undergraduate was interested in snails and invited me to his home in north Oxford. Anyone less like the popular conception of a don it is impossible to imagine; although we lost personal contact, except for occasional correspondence, after I went down, I have always thought of him with affection, which is the emotion he inspired in others.

Grensted was married in 1923 to Norah Frances, daughter of Herbert Knott, J.P., of Wilmslow. They had two sons, the elder of whom died in 1960; the younger is a Fellow of Christ's College, Cambridge, where he is a Lecturer in Engineering. An obituary was published in *The Times*, 19 March 1964, and biographical particulars can be found in *Who's Who* and Crockford's *Clerical Directory*. I am much indebted to Mrs. Grensted and to Dr. D. M. Hobby for kindly supplying information.

A. E. ELLIS

A. E. SALISBURY, 1876–1964

Albert Edward Salisbury was born at Putney on 24 January 1876, and passed away peacefully in his sleep at his home at High Wycombe on 27 May 1964. He was the son of James Wright Salisbury and Eliza (née Stimpson). His wife Sybil (née Evans) died a few years after their marriage, leaving no issue. He often spoke of his happy childhood with his parents, brothers and sisters at Limbrick Hall, near Harpenden, to which the family moved early in his life. His father held a leading position at the Treasury, and played chess for Hertfordshire. This talented family, living in the country, took an interest in natural history and formed collections of local plants, shells and insects, which the children exhibited in aid of charities. The youngest brother, Edward James, was appointed curator of these collections; he later became Quain Professor of Botany at London University and then Director of the Royal Botanic Gardens, Kew, being knighted in 1946. The celebrated artist, Frank O. Salisbury, was a cousin.

Albert was educated at St. George's School, Harpenden, and University College, London. He received further training as an engineer in the works of the London, Tilbury and Southend Railway Company. Later he was employed by the Bastian Meter Company, before becoming an electrical engineer at Loughborough. He was an Associate Member of the Institution of Electrical Engineers. At the early age of 31 he was sent to Russia, where he held a responsible position and learnt the rudiments of the Russian language.

Salisbury was an ingenious inventor and could construct almost anything that he required. His inventions include the bar electric fire (the patent of which he sold to the Belling Company), the immersion heater, ingenious patented devices for electric organs, and the mercury arc lamp; in conjunction with two other young men, he was beaten by Marconi by only three days in patenting a device for sending Morse signals by wireless telegraphy. During the 1914-18 war he made certain electrical devices for the Admiralty. On retiring to High Wycombe in 1936 he built in his music room a massive, three-manual electric organ with 27 stops: this operation took him 11 years. Although Salisbury could play the organ, he admitted that he could not read the music fast enough. When he and the writer were holding a joint microscope evening for the local Natural History Society, he produced a fine large compound microscope; when asked the maker's name he replied, "It's a Salisbury," but was rather indignant when it was suggested that he had bought the objectives. "They are easily made," he said, "one only needs to melt a little glass and polish it." The next year he gave the same Society a talk entitled "The building of a microscope." He made hundreds, if not thousands, of glass-topped boxes for his shells. Three weeks before his death he was collecting timber for building himself a table; he needed but a small one, for he lived all alone, as he had done for many years. Salisbury was always interested in how things were constructed and particularly in the way the shells of Mollusca are built. This he explained in an interesting article in the South Bucks Branch Journal of the British Naturalists' Association. From 1945 to 1962 he gave unstinting service as President and Chairman of the local branch and was extremely popular with the members.

The phenomenal amount of work that he accomplished, including household chores and gardening, was bewildering. As a retired business man, he knew the importance of organising his life. On certain days he went up to the British Museum (Natural History); on Sundays, after attending Holy Communion, he dealt with his world-wide correspondence. All engagements were booked in his diary and casual callers without an appointment were politely discouraged, especially on Sundays. When he rested, as he called it, from conchological studies he made specimen boxes, bound books, repaired clocks, or packed up parcels of shells to send to friends: "Uncle Sarum," as he was affectionately known, was very generous with his duplicates. When I took a single shell to him for identification, he would often give me one or two of the same kind "to keep it company". On a winter's night a tour of his numerous cabinets was unforgettable: he led the way dragging yards of flex attached to a powerful, shaded electric bulb which could be fixed to the side of an open drawer by means of an ingenious "Salisbury clip". When comparing an unknown shell with those in a cabinet he always held the unknown one in his left hand and the named specimen in his right hand; to avoid mistakes, he considered that this habit should be adopted by all conchologists.

When his great friend Tomlin presented his vast world-wide collec-

tion of shells to the National Museum of Wales, Salisbury's collection became the largest and best in private ownership in the British Isles, possibly in Europe: it had to be seen to be believed. The bulk of it was contained in some fifty cabinets, some of which were eight feet high. Thousands of other shells lay in trays and boxes about the spacious house, even in the roof space. In addition there were cabinets of world-wide Coleoptera (of which he had expert knowledge), Lepidoptera, Hymenoptera, etc., and also various fossils. Interspersed were gramophone records, foreign stamps, some fine antique furniture, clocks, china, glass, paintings and other possessions, which prevented the house from looking too much like a natural history museum. On all the floors and landings were numerous books, neatly classified, on a wide range of subjects. The extensive molluscan library, in many languages, would have been coveted by a millionaire conchologist.

Salisbury's collection of shells was world-wide and general, including a vast number of British specimens, several of which were in series showing successive stages in growth. About 1946 he purchased almost the entire stock of the late Hugh Fulton (of Sowerby & Fulton), one of the largest scientific shell dealers in the world, who claimed to stock nearly 25000 species. Amongst other purchases were large numbers of Clausiliidae and other groups bought from Tomlin, and numerous exchanges were made with museums and collectors in many parts of the world. His favourite groups were Tellinidae, Pectinidae, Cypraeidae, Volutidae, Pilidae and Clausiliidae; in recent years he has been interested in the genera *Prochilus*, *Achatinella* and *Amphidromus* (he was rather fascinated by sinistral species).

In 1962 Salisbury sent 39 cabinets of shells and 14 cases of books on Mollusca, in two furniture vans, to the Royal Scottish Museum, which lacked a really good molluscan collection. He was delighted that his old friend, A. R. Waterston, was going to be curator of this fine collection. While the vans were being loaded, Salisbury was highly amused when a massive 15-stone removals man tried to sound a conch shell: the giant could not raise a note, but his colleague, half the size, produced a series of bugle calls. He had been a regimental bugler! This shell music was much appreciated by Salisbury, who had once learnt to play the cornet. Not long after the shells and books had gone north, he had restarted collecting shells and molluscan literature: he was a born collector. Once when we were discussing the longevity of some of his departed conchological friends, he said that collectors were always looking to the future for fresh acquisitions, and he felt sure that it was this anticipation that kept them going so long. Not all his shells went to Edinburgh; for example, the world-wide collection of Tellinidae was willed to the British Museum (Natural History).

Salisbury collected many specimens of land, freshwater and marine shells during his extensive travels in the British Isles, including the Channel Islands. On these excursions he was often accompanied by his friends "Jack" Tomlin and Ronald Winckworth, and sometimes others. He attended numerous field meetings of the London branch

of the Conchological Society. During field excursions he became closely acquainted with many conchologists. He regarded Ronald Winckworth as the greatest natural genius and the finest character he had met in any walk of life. Like Tomlin, Salisbury was a coleopterist: often they found snails when hunting for beetles and vice versa. His Professor of Engineering, Sir Thomas Hudson Beare, a celebrated coleopterist, sometimes joined the excursions.

Salisbury was an Associate of the British Museum (Natural History) and spent much of his time working there in the Mollusca Section until about a year before his death, when his doctor advised him to discontinue the journey from High Wycombe; he was amused to learn that his angina tablets contained T.N.T. At the Museum his genial nature endeared him to many of the staff, not only in the Mollusca Section, for in the restaurant he met many from other sections. Numerous British and overseas molluscan experts and students who visited the Museum can recall his unstinted help and advice. "Uncle Sarum" spoke highly of his Museum colleagues; he was not one to belittle the efforts of his fellow workers, for, as a regular communicant, he believed firmly in living in love and charity with his neighbours. Of course he had his criticisms (and one or two critics). He was averse to unnecessary genus splitting, which was sometimes, he asserted, for the splitter's self advertisement. Such people he regarded as a menace to natural history and told them so. In his presidential address to the Malacological Society (1934) he stressed this matter (see pp. 79 and 87). In his 33 years of editing the Mollusca Section of the Zoological Record he saw much of this genus splitting. Other criticisms were directed against poor enunciation at scientific meetings, and amateur conchologists who "play" with shells rather than work with them; here he made charitable allowance for the capacity and training of the individual. Unlike some conchologists, Salisbury at an early age appreciated the importance of the "animal". His dexterity when dissecting the soft parts with needles and scalpel was most amazing.

Photography was another hobby: his many published photographs of shells testify to his proficiency. He was also a competent artist and made several excellent coloured drawings (unpublished) of shells. Until latterly the steadiness of his hands was quite remarkable. No doubt that, combined with great physical strength, enabled him to win the rifle shooting cup when he belonged to the 1st London Engineering Volunteers. He remarked more than once that it is no good believing in the Almighty unless one believes that He is almighty to guide one's hand. Here mention must be made of his wise administrative work at High Wycombe parish church, and his leading role in the town's Air Raid Precautions Committee during the last war.

Salisbury took an intense interest in the literature of Mollusca, as is shown by the fine library he amassed. His presidential address to the Conchological Society (1945) dealt with the writings (mainly) of British conchologists from the reign of Queen Anne to nearly the end of the nineteenth century. In 1931 Salisbury took over from H. B. Preston the editing of the Mollusca section of the Zoological Record, which he

continued up to the time of his death, the longest editorship of the Record since its commencement in 1868. For this task his working knowledge of some of the principal European languages, together with his early study of Latin, was a great asset. As the molluscan records became more numerous, the Zoological Society employed two very capable assistants, Dr. Marcia Edwards and Mrs. Pauline Curds, for whom Salisbury had nothing but praise.

Salisbury served conchology and malacology as well as anyone and in numerous ways. He was elected a member of the Conchological Society in 1906, was Hon. Treasurer from 1940 to 1958, and President from 1943 to 1945; he was elected an Honorary Member in 1955. He was President of the (now extinct) London Branch of the Society from 1915 to 1919. He was elected a member of the Malacological Society of London in 1915, was Hon. Secretary from 1920 to 1936, and President from 1933 to 1936.

Of Salisbury's publications on Mollusca, those competent to judge consider that his two most important papers are on Tellinidae (1934) and his joint paper on the types of Lamarck's genera selected by Children (1931). He was laid to rest on 4 June beside his wife in Westminster City Cemetery. Those of us who were privileged to know this brilliant outstanding personality must have been impressed by his genial sincerity; he was a Christian gentleman. Conchology has lost one of the last of the old school of great amateurs.

Salisbury's portrait forms the frontispiece to volume 23 of the *Proceedings of the Malacological Society of London* (1938). An excellent photograph taken at the British Museum (Natural History) appeared in *The Shell Magazine*, January 1953, and is here reproduced by courtesy of the Shell Photographic Unit. The writer is indebted to the following for information and assistance in writing this obituary of his old friend: Sir Edward Salisbury, Mr. T. E. Crowley, Mr. S. P. Dance, Mr. H. O. Ricketts and Dr. Joyce Rigby.

E. C. BADCOCK

PAPERS, NOTES AND OBITUARIES BY A. E. SALISBURY

J.C.=Journal of Conchology

P.M.S.=Proceedings of the Malacological Society of London

- 1916. *Physa heterostropha* Say in Bucks. J.C. **15**: 96.
- 1925. [with A. S. KENNARD and B. B. WOODWARD] Notes on the British post-Pliocene Unionidae, with more special regard to the means of identification of fossil fragments. P.M.S. **16**: 267-285, pls. 12-23 [photographs by A.E.S.].
- 1926. [with B. B. WOODWARD] Note on the misidentification by Hanley of Müllerian species of *Corbicula* with *Cardium virgineum* of Linné. P.M.S. **17**: 102.
- 1927. [with A. S. KENNARD and B. B. WOODWARD] Notes on British post-Pliocene Unionidae. 2. The hybrids between *Unio pictorum*, Linn., and *U. tumidus*, Retz., from Repton Park, Derbyshire. P.M.S. **17**: 191-197, pls. 15-27 [photographs by A.E.S.].
- 1928. A reference to the Portland Catalogue. P.M.S. **18**: 31.
- 1928. [with J. R. le B. TOMLIN] Laborde's 'Voyage' and the Mollusca therein described by Deshayes. P.M.S. **18**: 32-35.
- 1929. Variation in the shell of *H. lapicida* L. J.C. **18**: 324.
- 1929. A twice pre-occupied generic name. P.M.S. **18**: 255.

1929. *Polymetis*. *P.M.S.* **18**: 258.
1931. [with A. S. KENNARD and B. B. WOODWARD] The types of Lamarck's genera of shells as selected by J. G. Children in 1823. *Smithsonian Miscellaneous Collections*, **82**, No. 17: 1-40.
1932. On *Lepton squamosum* (Montagu) and *Montacuta ferruginosa* (Montagu) and some other molluscs observed in the Salcombe estuary, Devon. *P.M.S.* **20**: 100-103, pl. 9B.
1934. On the nomenclature of Tellinidae, with descriptions of new species and some remarks on distribution. *P.M.S.* **21**: 74-91, pls. 9-14.
1934. [with J. R. le B. TOMLIN] *Cypraea fultoni* Sowerby. *P.M.S.* **21**: 148, pl. 18.
1934. A new species of *Lucina*. *J.C.* **20**: 58, pl. 1.
1936. Two new species of marine gastropods. *P.M.S.* **22**: 124-125, pl. 13A.
1942. Charles Oldham as a conchologist. *North Western Naturalist*, Sept. 1942.
1943. Note by A. E. Salisbury [on Charles Oldham] *J.C.* **22**: 2.
1943. H. C. Fulton (1861-1942) [obituary]. *J.C.* **22**: 2-3.
1945. Work and workers on British Mollusca. *J.C.* **22**: 136-145, 149-165.
1946. Report on the Mollusca in Hertfordshire in 1945. *Trans. Herts. nat. Hist. Soc.*, **22**: 129.
1946. A copse in the Cotswolds *J.C.* **22**: 194-196.
1948. The *Conchologia Iconica* of Lovell Reeve. *J.C.* **22**: 306.
1949. A new species of *Rhiostoma*. *P.M.S.* **28**: 41-42, pl. 3B.
1949. A note on the Jeffreys collections [in Editorial Notes]. *J.C.* **23**: 55-56.
1951. Ronald Winckworth, 1884-1950 [obituary]. *P.M.S.* **29**: 1-5.
1952. Burnham Beeches, Bucks., 22 September 1951 [report of field meeting]. *J.C.* **23**: 283.
1953. Mollusca of the University of Oxford expedition to the Cayman Islands in 1938. *P.M.S.* **30**: 39-54, pls. 7, 8.
1953. Obituary: Harry Overton, 1875-1951. *J.C.* **23**: 299.
1953. Obituary: J. E. Cooper, 1864-1952. *J.C.* **23**: 339-341.
1954. Obituary notice: Henry Otho Nicholson Shaw, 1889-1954. *P.M.S.* **31**: 29.
1955. Obituary: J. R. le B. Tomlin, 1864-1954. *J.C.* **24**: 29-33.
1955. Obituary notice: J. R. le B. Tomlin, 1864-1954. *P.M.S.* **31**: 85-87.
1955. [with H. O. RICKETTS] List of papers on Mollusca and obituaries of conchologists published by the late J. R. le B. Tomlin. *P.M.S.* **31**: 87-94.
1959. Hugh Watson, 1885-1959 [obituary]. *P.M.S.* **33**: 173-175.

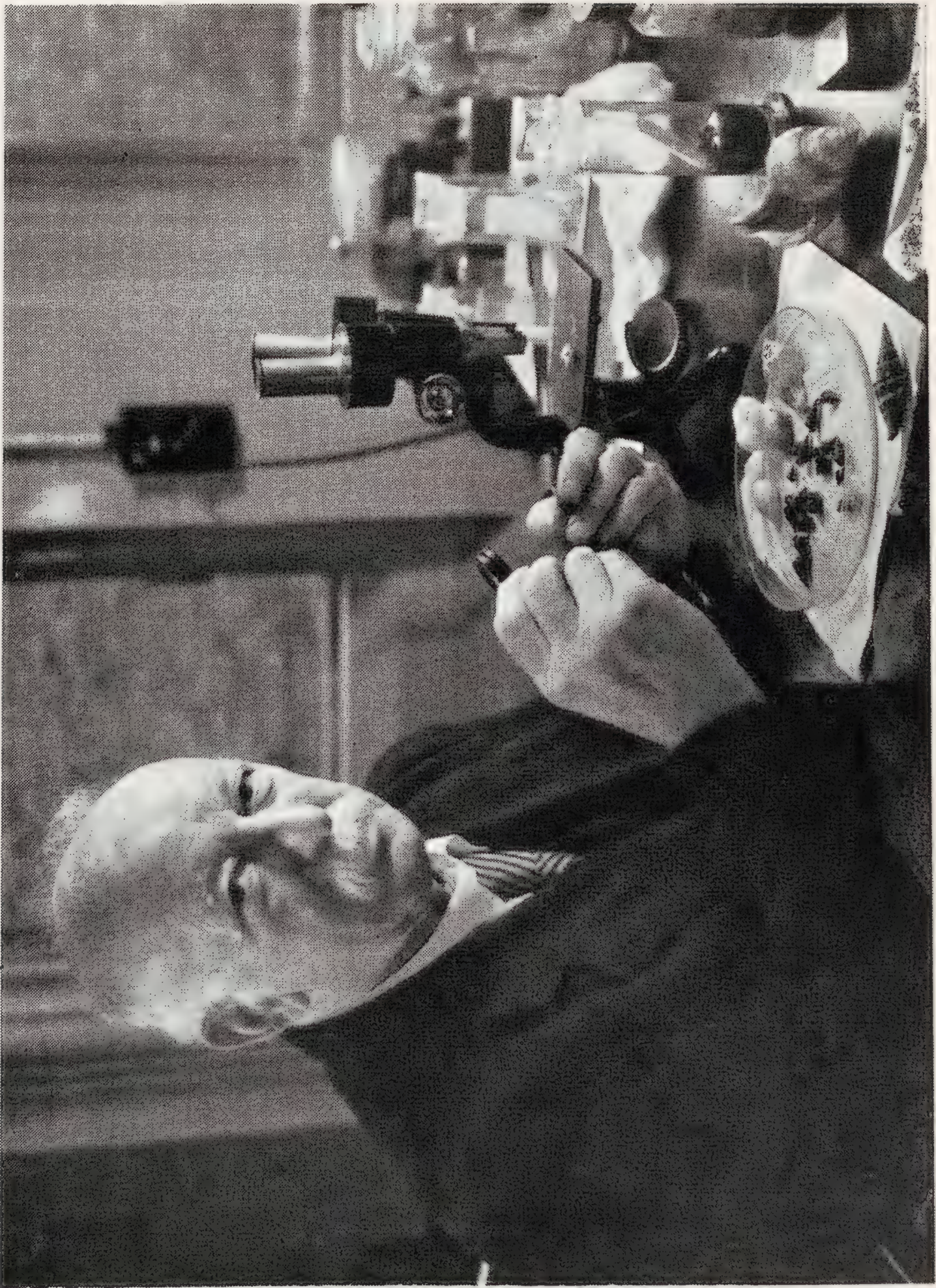
SPECIES NAMED IN HONOUR OF A. E. SALISBURY

- Turritella salisburyi* Tomlin, 1925. *Ann. S. Afr. Mus.* **20**: 314.
- Fusinus salisburyi* Fulton, 1930. *Proc. malac. Soc. Lond.* **19**: 16.
- Squamopleura salisburyi* Leloup, 1939. *Bull. Mus. Hist. nat. Belg.* **15**: 9.

Milax budapestensis (Hazay) in woodland

In 1942 I recorded finding this slug in natural woodland in Surrey (*J. Conch.* **21**: 325). On 27 April 1964 I again found this species in woodland remote from gardens at Haydon Wood, Kenton, Devon (Grid SX (20) 928835). The trees were mainly oak, with some sweet chestnut, beech and ash, also bramble, elder and nettle. Mollusca were hard to find, but the following were noted at the same place: *Garychium tridentatum*, *Clausilia bidentata*, *Discus rotundatus*, *Helix nemoralis*, *Arion circumscriptus*, *A. hortensis*, *A. ater*, *Oxychilus alliarius*, *O. helveticus*, *Vitrina pellucida* and *Limax cinereoniger*, the last an unusual companion for a *Milax*.

A. E. ELLIS



Albert E. Salm, Jr.

THE BRITISH MARINE CENSUS AREAS

By D. HEPPELL

The Conchological Society of Great Britain and Ireland has for many years kept distribution records of the British marine Mollusca, but no Census has ever been published. For each species, distribution maps, based on the Areas and Sub-areas suggested by Winckworth in 1921 (*J. Conch.* **16**: 154), have been maintained by the Marine Recorders.

Early in 1961, the Council of the Society appointed a Sub-committee, consisting of Mr. L. W. Stratton (Chairman), Mrs. N. F. McMillan and Mr. D. Heppell (Secretary), to consider questions relating to the production of a published Census of equivalent status to that of the British non-marine Mollusca. The recommendations submitted were approved by Council and the first details of the proposed Marine Census were circulated to Members of the Society and other interested persons in April 1962, in the form of seven duplicated sheets entitled *A Census of the Distribution of the British marine Mollusca*. Because of the evident interest in the proposal, and for the benefit of those Members who have joined the Society since the above circular was produced, Council have considered it desirable that certain portions of it should now be republished in the *Journal of Conchology*. At their request a map of the Census Areas has been added to illustrate the text. Other information relevant to the collection and preservation of marine Mollusca, and to the aims and objects of the Marine Census, will be made available in the *Papers for Students* series.

THE SCOPE OF THE CENSUS

The British Marine Area of 1901, as proposed in that year by a Committee of the Conchological Society and on which the Census Areas of Winckworth were based, was not entirely suitable for the present purposes as several of its boundaries were inadequately defined. In consequence, the limits were re-defined by the 1961 Sub-committee, and the resultant modified Area is known as the **British Marine Area 1961**. It comprises the **British Marine Census Area**, within the 100 fathom (fm.) contour, together with the **North Atlantic Area** beyond 100 fm.

That part of the British Marine Area 1961 within the 100 fm. limit, to be known as the British Marine Census Area, has been divided into 40 **Census Areas**, the names and detailed limits of which are given below. That part of the British Marine Area 1961 outside the 100 fm. limit (i.e. the North Atlantic Area) will, for the purposes of the Census, be treated as a separate entity.

The Census will include all species of marine Mollusca found living within the British Marine Area 1961, but species known only from the North Atlantic Area beyond the 100 fm. contour will be listed separately, and not included within the main body of the Census. Whenever possible, suitable material is obtained for inclusion in the Central

Voucher Collection, housed at the British Museum (Natural History), and it is hoped that a number of Regional Collections will also be established, in order that reference collections of authenticated material may be available in various parts of the country. The Marine Recorder, with the assistance of the Census Referees, is responsible for the authentication and recording of all specimens.

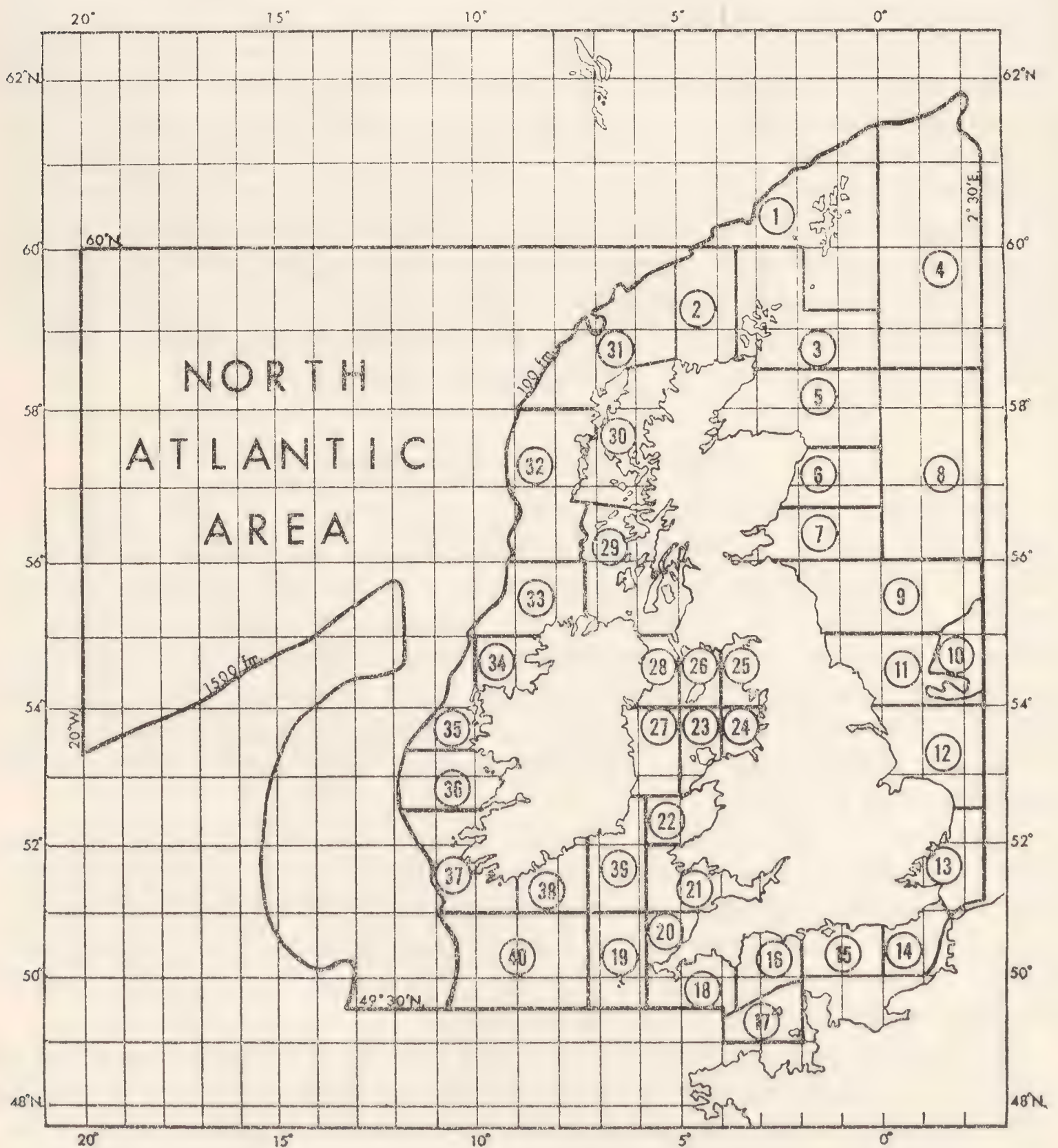
LIMITS OF THE BRITISH MARINE AREA 1961

West of the 100 fm. contour these correspond with the limits of the North Atlantic Area, and east of the 100 fm. contour with those of the British Marine Census Area.

LIMITS OF THE NORTH ATLANTIC AREA

The boundaries of that part of the British Marine Area 1961 outside of the British Marine Census Area are:

60° 0' N.; 100 fm.; 49° 30' N.; 1500 fm.; 20° 0' W.



THE BRITISH MARINE CENSUS AREAS.

LIMITS OF THE BRITISH MARINE CENSUS AREA

The British Marine Census Area has been delimited thus:

West and North

From latitude $49^{\circ} 30' \text{ N.}$ by the 100 fm. contour line passing northwards and eastwards to longitude $2^{\circ} 30' \text{ E.}$

East

Longitude $2^{\circ} 30' \text{ E.}$ southwards to the northern limit of the French intertidal zone.

South

The northern limit of the French intertidal zone westwards and southwards to latitude $50^{\circ} 0' \text{ N.}$, then due west to longitude $2^{\circ} 0' \text{ W.}$, then south to latitude $49^{\circ} 0' \text{ N.}$, due west again to longitude $4^{\circ} 0' \text{ W.}$, then north to latitude $49^{\circ} 30' \text{ N.}$, then due west till the 100 fm. contour is reached.

The Channel east of the Meridian and north of $50^{\circ} 0' \text{ N.}$ is not conveniently divisible into British and French areas either by fathom contour lines or by lines of latitude and longitude. It is for this reason that the whole of that part of the Channel will be considered as both British and French with regard to dredged specimens and non-littoral species. This will more nearly represent the British distribution of marine species than any arbitrary "mid-line" arrangement.

SUBDIVISION OF THE BRITISH MARINE CENSUS AREA INTO CENSUS AREAS

The following are the names and boundaries of the Census Areas:

- | | |
|---------------------|--|
| 1. SHETLAND | 100 fm.; 0° ; $59^{\circ} 15' \text{ N.}$; $1^{\circ} 50' \text{ W.}$; $60^{\circ} 0' \text{ N.}$ |
| 2. SUTHERLAND | $5^{\circ} 0' \text{ W.}$ [Cape Wrath]; 100 fm.; $60^{\circ} 0' \text{ N.}$; $3^{\circ} 30' \text{ W.}$ |
| 3. ORKNEY | $3^{\circ} 30' \text{ W.}$; $60^{\circ} 0' \text{ N.}$; $1^{\circ} 50' \text{ W.}$; $59^{\circ} 15' \text{ N.}$; 0° ; $58^{\circ} 30' \text{ N.}$ |
| 4. VIKING | 100 fm.; $2^{\circ} 30' \text{ E.}$; $58^{\circ} 30' \text{ N.}$; 0° . |
| 5. MORAY FIRTH | $58^{\circ} 30' \text{ N.}$; 0° ; $57^{\circ} 30' \text{ N.}$ [Buchan Ness]. |
| 6. ABERDEEN | $57^{\circ} 30' \text{ N.}$; 0° ; $56^{\circ} 40' \text{ N.}$ |
| 7. FIRTH OF FORTH | $56^{\circ} 40' \text{ N.}$; 0° ; $56^{\circ} 0' \text{ N.}$ |
| 8. NORTH SEA | $58^{\circ} 30' \text{ N.}$; $2^{\circ} 30' \text{ E.}$; $56^{\circ} 0' \text{ N.}$; 0° . |
| 9. NORTHUMBERLAND | $56^{\circ} 0' \text{ N.}$; $2^{\circ} 30' \text{ E.}$; 20 fm.; $55^{\circ} 0' \text{ N.}$ |
| 10. DOGGER | 20 fm.; $2^{\circ} 30' \text{ E.}$ |
| 11. YORKSHIRE | $55^{\circ} 0' \text{ N.}$; 20 fm.; $2^{\circ} 30' \text{ E.}$; $54^{\circ} 0' \text{ N.}$ |
| 12. WASH | $54^{\circ} 0' \text{ N.}$; $2^{\circ} 30' \text{ E.}$; $52^{\circ} 30' \text{ N.}$ |
| 13. THAMES | $52^{\circ} 30' \text{ N.}$; $2^{\circ} 30' \text{ E.}$; northern limit of French intertidal zone; line joining Cap Gris Nez and Dover. |
| 14. EAST CHANNEL | Line joining Cap Gris Nez and Dover; northern limit of French intertidal zone; $50^{\circ} 0' \text{ N.}$; 0° . |
| 15. WIGHT | 0° ; $50^{\circ} 0' \text{ N.}$; $2^{\circ} 0' \text{ W.}$ [St. Alban's Head]. |
| 16. PORTLAND | $2^{\circ} 0' \text{ W.}$; 50 fm. contour north of Hurd Deep; $3^{\circ} 40' \text{ W.}$ [Start Point]. |
| 17. CHANNEL ISLES | 50 fm. contour north of Hurd Deep; $2^{\circ} 0' \text{ W.}$; $49^{\circ} 0' \text{ N.}$; $4^{\circ} 0' \text{ W.}$ |
| 18. WEST CHANNEL | $3^{\circ} 40' \text{ W.}$; 50 fm.; $4^{\circ} 0' \text{ W.}$; $49^{\circ} 30' \text{ N.}$; $5^{\circ} 50' \text{ W.}$; latitude of Cape Cornwall. |
| 19. SCILLY ISLES | $51^{\circ} 0' \text{ N.}$; $5^{\circ} 50' \text{ W.}$; $49^{\circ} 30' \text{ N.}$; $7^{\circ} 15' \text{ W.}$ |
| 20. NORTH CORNWALL | Latitude of Cape Cornwall; $5^{\circ} 50' \text{ W.}$; $51^{\circ} 0' \text{ N.}$ |
| 21. BRISTOL CHANNEL | $51^{\circ} 0' \text{ N.}$ [Hartland Point]; $5^{\circ} 50' \text{ W.}$; $52^{\circ} 0' \text{ N.}$ |
| 22. CARDIGAN BAY | $52^{\circ} 0' \text{ N.}$; $5^{\circ} 50' \text{ W.}$; $52^{\circ} 45' \text{ N.}$ [Bardsey]. |
| 23. ANGLESEY | $52^{\circ} 45' \text{ N.}$; $5^{\circ} 0' \text{ W.}$; $54^{\circ} 0' \text{ N.}$; $4^{\circ} 0' \text{ W.}$ |
| 24. LIVERPOOL BAY | $4^{\circ} 0' \text{ W.}$; $54^{\circ} 0' \text{ N.}$ |
| 25. SOLWAY | $54^{\circ} 0' \text{ N.}$; $4^{\circ} 0' \text{ W.}$ |
| 26. ISLE OF MAN | $4^{\circ} 0' \text{ W.}$; $54^{\circ} 0' \text{ N.}$; $5^{\circ} 0' \text{ W.}$ |

27.	DUBLIN	54° 0' N.; 5° 0' W.; 52° 45' N.
28.	BELFAST	55° 0' N.; 5° 0' W.; 54° 0' N.
29.	CLYDE & ARGYLL	55° 0' N.; 7° 25' W. [Malin Head]; 50 fm.; line joining Ardnamurchan Point and Barra Head.
30.	MINCH	Line joining Ardnamurchan Point and Barra Head; line joining Butt of Lewis and Cape Wrath. (In the Sound of Harris, MINCH is east of 7° 0' W. and south of 57° 40' N.)
31.	LEWIS	58° 0' N.; 100 fm.; 5° 0' W.; line joining Butt of Lewis and Cape Wrath.
32.	UIST	Line joining Ardnamurchan Point and Barra Head; 50 fm.; 56° 0' N.; 100 fm.; 58° 0' N.
33.	NORTH DONEGAL	55° 0' N.; 100 fm.; 56° 0' N.; 7° 25' W.
34.	DONEGAL BAY	10° 0' W.; 55° 0' N.
35.	MAYO	53° 25' N. [Slyne Head]; 100 fm.; 55° 0' N.; 10° 0' W.
36.	GALWAY BAY	52° 30' N. [Loop Head]; 100 fm.; 53° 25' N.
37.	FASTNET	9° 0' W. [Galley Head]; 51° 0' N.; 100 fm.; 52° 30' N.
38.	CORK	7° 15' W.; 51° 0' N.; 9° 0' W.
39.	NYMPHE BANK	52° 45' N.; 5° 50' W.; 51° 0' N.; 7° 15' W.
40.	SOLE	51° 0' N.; 7° 15' W.; 49° 30' N.; 100 fm.

COASTLINE INCLUDED IN THE CENSUS AREAS

1. Shetland; Fair Isle.
2. Sutherland, from Cape Wrath; Caithness, to Dunnet Bay.
3. Orkney; Caithness, from Dunnet Bay to Noss Head.
4. [Entirely offshore.]
5. Caithness, from Noss Head; E. coasts of Sutherland and Ross and Cromarty; N. coast of Inverness; Nairn, Moray, Banff; Aberdeen, to Buchan Ness.
6. Aberdeen, from Buchan Ness; Kincardine; Angus, to Lunan Bay.
7. Angus, from Lunan Bay; Perth, Fife, Clackmannan, Stirling, West Lothian, Midlothian; East Lothian, to Dunbar.
8. [Entirely offshore.]
9. East Lothian, from Dunbar; Berwick; Northumberland.
10. [Entirely offshore.]
11. Durham; Yorkshire, to Bridlington Bay.
12. Yorkshire, from Bridlington Bay; Lincolnshire, Norfolk; Suffolk, to Lowestoft.
13. Suffolk, from Lowestoft; Essex; Kent, to Dover.
14. Kent, from Dover; Sussex, to Newhaven.
15. Sussex, from Newhaven; Hampshire [including the Isle of Wight]; Dorset, to St. Alban's Head.
16. Dorset, from St. Alban's Head; Devon, to Start Point.
17. Channel Isles.
18. Devon, from Start Point; Cornwall, to Cape Cornwall [St. Just].
19. Isles of Scilly.
20. Cornwall, from Cape Cornwall; Devon, to Hartland Point.
21. Devon, from Hartland Point; Somerset, Gloucester, Monmouth, Glamorgan, Carmarthen; Pembroke, to Strumble Head.
22. Pembroke, from Strumble Head; Cardigan, Merioneth; Caernarvon, to Bardsey Island.
23. Caernarvon, from Bardsey Island to Llanfairfechan; Anglesey.
24. Caernarvon, from Llanfairfechan; Denbigh, Flint, Cheshire; Lancashire, to the estuary of the River Lune.
25. Lancashire, from the estuary of the River Lune [including Westmorland]; Cumberland, Dumfries; Kirkcudbright, to Abbey Head.
26. Kirkcudbright, from Abbey Head; Wigtown, to Port Logan; Isle of Man.
27. Wicklow, Dublin, Meath; Louth, to Dundalk.
28. Louth, from Dundalk; Down; Antrim, to Carnlough; Wigtown, from Port Logan to Corsewall Point.

29. Antrim, from Carnlough; Londonderry; Donegal, to Malin Head; Wigtown, from Corsewall Point; Ayr, Renfrew, Dunbarton, Bute [including the Isles of Cumbrae and Arran]; Argyll, to Ardnamurchan Point [including the Isles of Gigha, Islay, Jura, Oronsay, Colonsay, Mull, Iona, Tiree and Coll].
30. Argyll, from Ardnamurchan Point; Inverness [including the Isles of Muck, Eigg, Rhum, Canna, Skye and Raasay]; W. coast of Ross and Cromarty; Sutherland, to Cape Wrath; E. coasts of Barra, South Uist, Benbecula, North Uist, Harris and Lewis.
31. W. coast of Lewis; W. coast of Harris to Scarpay.
32. W. coast of Harris, from Scarpay; W. coasts of North Uist, Benbecula, South Uist and Barra.
33. Donegal, from Malin Head to Aran Is. [Co. Donegal].
34. Donegal, from Aran Is.; Leitrim, Sligo; Mayo, to Erris Head.
35. Mayo, from Erris Head; Galway, to Slyne Head.
36. Galway, from Slyne Head [including the Aran Islands]; Clare, to Loop Head.
37. Clare, from Loop Head; Limerick, Kerry; Cork, to Galley Head.
38. Cork, from Galley Head; Waterford, to Dunabrattin Head.
39. Waterford, from Dunabrattin Head; Wexford.
40. [Entirely offshore.]

ACKNOWLEDGMENT

I would like to thank Mr. S. L. Hill of the Zoology Department, Glasgow University, for his considerable assistance with the preparation of the map.

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

811th (Special General) Meeting, held at the British Museum (Natural History), 15 February 1964

The President, Mr. L. W. Stratton, in the chair.

The revised draft of the Rules of the Society was unanimously approved.

812th (Annual General) Meeting, held at the British Museum (Natural History), 15 February 1964

The President, Mr. L. W. Stratton, in the chair.

Election of Members

Mrs. Edith Constance Biggs, 48 Park Road, Bromley, Kent.

Mrs. R. L. Markham, 97 Canfield Gardens, Hampstead, London, N.W.6.

Stanislaw Markowski, D.Sc., School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1.

Professor Dr. Franz A. Schilder, Schleiermacher Strasse 19, Halle/Salle, German Democratic Republic.

J. W. Stephenson, M.Sc., M.I.Biol., Rothamsted Experimental Station, Harpenden, Herts.

Appointment of Scrutineers

Mr. R. J. Cleevely and Mr. P. E. Negus were appointed Scrutineers.

Election of Auditors

Mr. P. Coxhead and Miss M. Maitland Howard were re-elected Auditors.

Annual Reports

The reports of the Council, the Recorders of non-marine and marine Mollusca, and the Organiser of field meetings were presented and adopted.

Statement of Accounts

The Hon. Treasurer presented the audited accounts for 1963, which were adopted.

Votes of Thanks

Votes of thanks were approved to the Officers and Council, to the Trustees of the British Museum (Natural History), and to the Manageress of the Museum Restaurant.

Presidential Address

The President delivered an address on "Collecting at Dale, Pembrokeshire," illustrated by specimens and charts.

Election of Officers and Council

The officers and council were declared elected, as shown on page 223.

Exhibits

Mrs. E. M. Crowley: pearls of *M. margaritifera* from Scotland.

Mr. P. E. Negus and Mr. T. Pain: Liassic Ammonites of the family Liparoceratidae.

Mrs. A. M. Brockbank: marine shells from Galway, etc.

Major P. K. Earle: living *Testacella maugei* collected at Ruan Minor, W. Cornwall, by Mrs. Ainsworth.

Mr. D. G. Pickrell: shells from the Red Crag, Walton-on-the-Naze, Essex.

Mr. G. W. Pitchford: marine and non-marine shells from the Channel Islands and counties Antrim and Down; lists of species from Guernsey, Herm, Cumberland, Westmorland and N. Lancashire.

Mr. R. P. Scase: *Cypraea (Erosaria) ostergaardi* Dall, dredged off Waikiki, Honolulu, 28.ii.1963, subfossil (only two live-collected specimens are known); *C. helvola hawaiiensis* Melvill was shown for comparison.

Report of the Council

MEMBERSHIP. 41 members were elected during the year and one reinstated; 5 members have resigned and one, Dr. F. F. Laidlaw, has been lost by death. The net gain in membership is accordingly 36, 5 more than in 1962, and the present total stands at 287, including 4 honorary and 20 life members. There has also been an increase in the number of subscribers.

MEETINGS. Seven ordinary meetings and one annual general meeting have been held at the British Museum (Natural History), by kind permission of the Trustees, the average attendance being nearly 40. In connection with the meetings, a lantern lecture was given by Dr. L. V. Knutsen and a colour film was shown by Dr. S. Markowski. Field meetings were also held.

PUBLICATIONS. Volume 25, No. 4 of *The Journal of Conchology* was issued on 3 April and No. 5 on 11 October, 1963. *The Conchologists' Newsletter* No. 7 was issued in February and No. 8 in September.

JUNIOR SECTION. The Council and a nominated sub-committee have given this close study and it is expected that the organization of the Junior Section will soon be completed by the Revd. H. E. J. Biggs, assisted by Mr. L. W. Stratton.

Field Meetings

Seven field meetings were held in 1963. On 9 March, in the worst possible weather, a visit was paid to the Norwich Crag sections at Thorpe and Bramerton, under the expert guidance of Mr. P. Cambridge. On returning to Norwich, the magnificent collection of Crag shells in the Castle Museum was examined, through the kindness of the Assistant Keeper of Natural History, Mr. R. Markham. Marine shell specialists were catered for on 21 April, when Mr. L. C. Prebble conducted an expedition to Seaview, Isle of Wight, and the opportunity of a low tide on 5 May was taken to visit Camber Sands, Sussex, under the direction of Mr. R. Fresco-Corbu. Those who wished to visit a known locality for *Ena montana* were gratified on 9 June, when Dr. L. Lloyd-Evans led a party to Capon's Wood, Wyddial, Herts. On 31 July Purfleet and the brackish lagoons at East Tilbury, Essex, were visited under the guidance of Mr. J. Cooper and Mr. D. Heppell, while the former conducted a party to Dartford Marshes, Kent, on 15 September, to compare their fauna with that observed on the Essex side of the Thames. The last field meeting of the year was held at Dover on 20 October, where an unexpectedly large party assembled undeterred by an ominous weather forecast, which proved more than justified. Under the leadership of Miss D. Beatty and Dr. M. P. Kerney the River Dour was visited; although this was found to be very low, some collecting was possible. In the afternoon the party went to Hawkhill Down, Walmer, where *Helicella elegans* was still to be found in abundance. A short visit was also paid to Dover Castle.

The Field Meetings Organizer wishes to express most grateful thanks to all who so kindly arranged and led these meetings, which are such a popular and important aspect of the Society's activities.

T. PAIN.

Recorder's Report: non-marine Mollusca

A. VICE-COUNTY RECORDS

Since the last report (Vol. 25, p. 215) the following new vice-county records have been authenticated:

Scilly (1a): *Columella edentula*, St. Helen's, June 1963; *Arion fasciatus* (*circumscriptus*), Samson, June 1963; *Vitrea contracta*, Porth Cressa, St. Mary's, June 1962; *Agriolimax laevis*, Rose Hill, St. Mary's, June 1963; all by Mrs. S. M. Turk.

Cornwall West (1): *Cochlicopa lubrica* s.s., Porthleven, 1955, Mrs. S. M. Turk; *Vitrea contracta*, Dec. 1956, H. B. Sargent.

Cornwall East (2): *Vitrea crystallina* s.s., *V. contracta*, Anderton, near Lesnewth, 1963, Mrs. S. M. Turk.

Surrey (17): *Arion rufus*, Wallington, May 1963, A. E. Ellis.

Caernarvon (49): *Arion lusitanicus*, Bangor, Nov. 1963, N. W. Runham, det. H. E. Quick.

Flint (51): *Vertigo antivertigo*, Padeswood, near Mold, March 1963,

J. O'N. Millott.

Chester (58): *Bithynia leachi*, Shropshire Union Canal, Wrenbury, Oct. 1963, J. O'N. Millott.

Orkney (111): *Agriolimax caruanae*, Rendall, Mainland (garden), Oct. 1963, E. Kellock.

Cork West (147): *Carychium minimum* s.s., *Vallonia excentrica*, Clear Island, 1963, L. Lloyd-Evans.

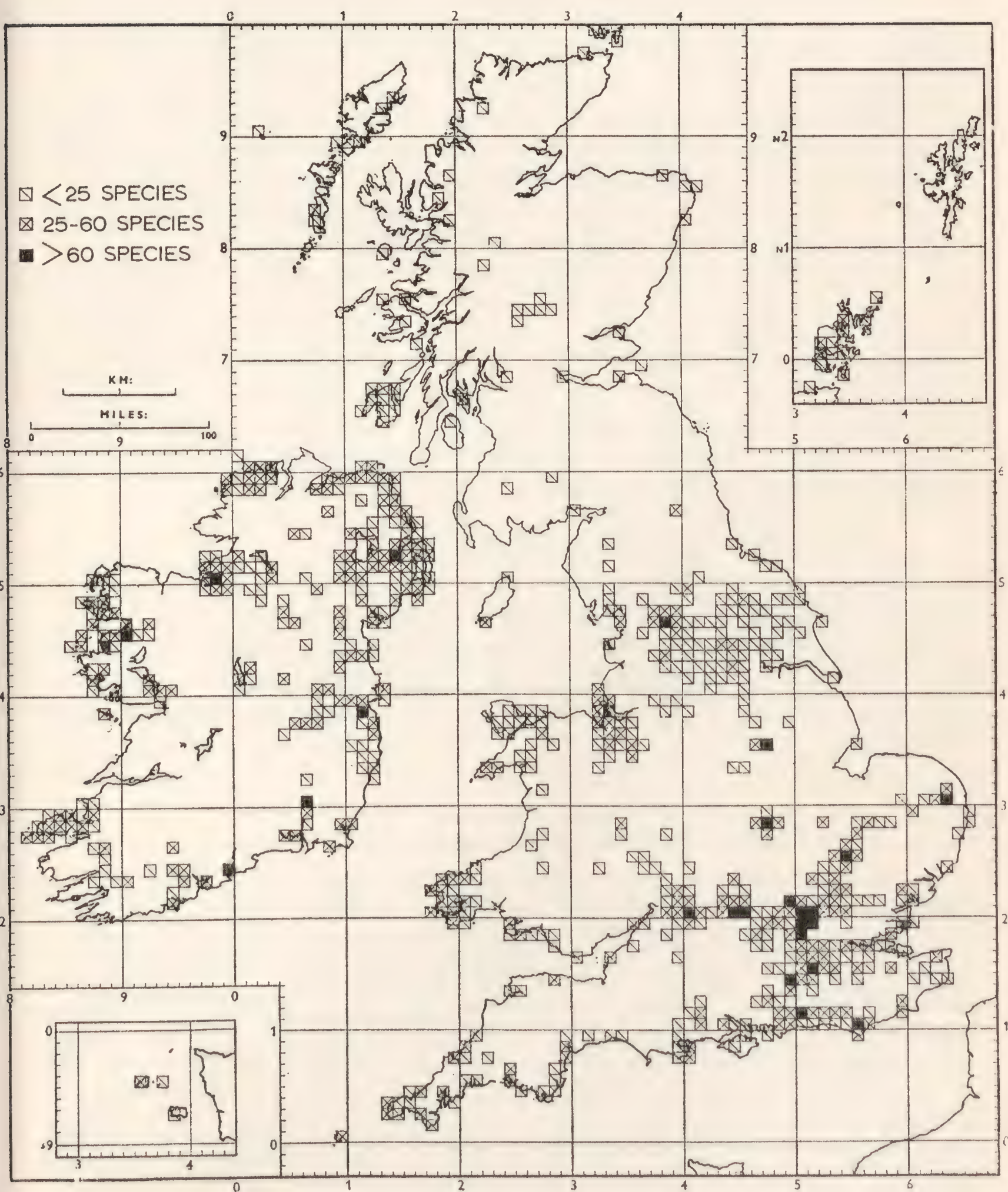
The most interesting of these records is that of *Arion lusitanicus*, the third confirmed British record and the first for Wales. The species was previously authenticated from near Nuneaton (38) and Durham (61), while there is an old unconfirmed record from Cork West (147). *Agriolimax caruanae*, now confirmed from Orkney, seems likely to prove widespread in humanly influenced habitats. It is now recorded for 19 vice-counties in England, Wales, Scotland and Ireland.

B. IRISH VICE-COUNTIES

Some confusion has recently arisen from the fact that the numbering of the Irish vice-counties used by the Conchological Society differs from the system employed by most other natural history organizations. Under our system the Irish vice-counties are numbered from 113 (Londonderry) to 148 (Kerry), following on from Zetland (112), whereas the more general practice is to use the numbering of Praeger (1896, *Irish Nat.* 5: 29–38), who numbered the divisions independently from 1 to 40, commencing at Kerry and ending at Derry. To avoid confusion with the English vice-counties, the numerals are prefixed with the letter H (for Hibernia). This system is that employed by the Botanical Society of the British Isles and used in the collection of data for their 10 km. square mapping scheme, which our Society has now adopted. Under this scheme the vice-comital number is among the data which are punched as a code on the record cards, and it is obviously desirable that a common system should be followed by all bodies concerned with distribution mapping. It is accordingly proposed that this Society should in future adopt Praeger's enumeration of the Irish vice-counties; the names remain unaltered. The correlation of the two systems is as follows:

Kerry South	148S	H1	Dublin	124	H21
Kerry North	148N	H2	Meath	123	H22
Cork West	147	H3	Westmeath	132	H23
Cork Mid	146M	H4	Longford	133	H24
Cork East	146E	H5	Roscommon	134	H25
Waterford	145	H6	Mayo East	137	H26
Tipperary South	144	H7	Mayo West	138	H27
Limerick	142	H8	Sligo	136	H28
Clare	141	H9	Leitrim	135	H29
Tipperary North	143	H10	Cavan	121	H30
Kilkenny	129	H11	Louth	122	H31
Wexford	127	H12	Monaghan	117	H32
Carlow	128	H13	Fermanagh	120	H33
Leix (Queen's Co.)	130	H14	Donegal East	119E	H34

Galway South-East	140S	H15	Donegal West	119W	H35
Galway West	139	H16	Tyrone	118	H36
Galway North-East	140N	H17	Armagh	116	H37
Offaly (King's Co.)	131	H18	Down	115	H38
Kildare	125	H19	Antrim	114	H39
Wicklow	126	H20	Derry	113	H40



C. 10 KILOMETRE SQUARE MAPPING

Records under the 10 km. square recording scheme are coming in rather more slowly than was hoped. The map shows those squares for which regional record cards (large white cards) have been sent to the Recorder, or have been compiled by him using reliable post-1900 information. They represent a coverage of 647 squares out of a total of about 3,500, or about 18 per cent. of the area of the British Isles. Even for many of these worked squares it is certain that only a small proportion of the total molluscan fauna which they contain has yet been recognized and listed: anything fewer than 25 species must be regarded as very poor, at least in most calcareous areas. "Difficult" groups, such as slugs and *Pisidium*, tend to be neglected, as are also the segregates of *Garychium*, *Cochlicopa* and *Vitrea*. If an adequate coverage of the country is to be achieved within a reasonable period of years, it is clear that efforts will have to be much intensified. The Recorder would be pleased to hear from anyone who would like to help with the scheme, and would gladly provide further information. Specimens of doubtful identity should be sent to him.

The records for Ireland shown on the map are almost entirely due to Mr. A. W. Stelfox, who kindly made available to the Recorder his excellent journals covering the years 1904 to 1917. Members are reminded that the British National Grid does not cover Ireland. A complete set of specially gridded maps of Ireland is held by the Recorder, and those contemplating field work there should write to him, enclosing their own 1 or $\frac{1}{2}$ inch maps of the area which they intend to work, so that the lines of the grid can be added.

EXPLANATION OF MAP

Map showing the distribution of National Grid 10 km. squares for which one or more regional cards is held by the Recorder (August 1964). Isolated records, entered on individual record cards, are not included. The grid reference of any 10 km. square shown on this map can be read by placing a ruler across the co-ordinates marked in the margin.

M. P. KERNEY

Recorder's Report: marine Mollusca

Once again I have pleasure in reporting the continued interest of Members in the revived Marine Census scheme. In particular, I should like to thank Mrs. S. M. Turk, through whose unfailing energies a very full set of specimens from Cornwall and the Isles of Scilly has been added to the Voucher collection, Mr. L. S. Atkins, for bringing the Conchological Society's Marine Census to the notice of the readership of the *Irish Naturalists' Journal* (*Irish Nat. J.* **14**: 180-181), and Mr. I. C. J. Galbraith, for similarly informing the Scientific and Technical Group of the British Sub-Aqua Club (*Sci. Tech. Grp. Brit. Sub-Aq. Club News* July 1963: 6). The Biology Section of this diving group has already contributed some specimens from the Swanage area, and has

reported the presence there of *Patina pellucida* (L.) in almost plague proportions in the summer of 1963. The University of London Sub-Aqua Club has also contributed live-collected material to the Voucher collection, and it is to be hoped that other diving clubs will similarly use their unique opportunities to further the Marine Census in this way.

Recently, two important marine fauna lists have been issued. J. A. Allen's *Mollusca* was published in 1962 by the Scottish Marine Biological Association in their series *Fauna of the Clyde Sea Area*; 430 species are recorded in its 88 pages. The price of this work to non-members of the S.M.B.A. is 7s. 6d. *Marine Fauna of the Isle of Man and its surrounding seas*, edited by J. R. Bruce, J. S. Colman and N. S. Jones, was published in 1963 by the Liverpool University Press as No. 36 in the series *L.M.B.C. Memoirs*. This work, the arrangement of which is based on that of the *Plymouth Marine Fauna List*, costs 63s.; 39 of its 307 pages are devoted to the Mollusca, 337 species being recorded from that Area. Copies of these two works were displayed at the Annual General Meeting.

As in my previous Report, I should again like to take this annual opportunity to bring to the attention of the Society some recent additions and emendations to the list of British marine Mollusca.

Patella depressa Pennant. There seems little justification for retaining the name *P. intermedia* Jeffreys in place of Pennant's prior and more appropriate *P. depressa*, as have several recent workers including Fretter & Graham (1962. *British Prosobranch Molluscs*) on the grounds of confusion resulting from some authors' usage of that name for *P. aspera* Röding. The identity of Pennant's species was established by Tomlin, 1923 (*J. Conch.* 17: 34) and the type-specimen is still extant in the collection of the British Museum (Natural History). In my previous Report (*J. Conch.* 25: 216), some Irish shells were tentatively assigned to this species. Their locality was erroneously given as Dingle Peninsula, Co. Kerry, and should have been Skull, Co. Cork. Subsequent examination of the animals showed them to be only a variety of *P. vulgata* L. Similar specimens were found by the Recorder at Courtmacsherry, Co. Cork in summer 1963, and by Mrs. S. M. Turk in Cornwall and the Scilly Isles. I am in agreement with Mrs. Turk's opinion that these probably represent the variety *picta* Jeffreys. They may be distinguished from the true *P. depressa* by the absence of white pallial tentacles.

Littorina saxatilis (Olivi). James, 1963 (*Cahiers Biol. mar.* 4: 11-19), records a population of *L. saxatilis* exhibiting extreme variability of coloration from Rubna na Faing, Islay, Scotland. In all, 164 different colour patterns were observed in a sample of 400 shells, though all were referred to the same sub-species *L. s. tenebrosa* (Montagu). James is unable to correlate the observed variation with any environmental factor. It is noteworthy that the name *tenebrosa* which, traditionally, has been reserved for mottled or dark-coloured forms from sheltered brackish-water habitats, is here used for multicoloured specimens from an exposed marine locality. The type series of

Montagu's *Turbo tenebrosus* is still preserved in the British Museum (Natural History). Mr. James is continuing his work on the taxonomy of the sub-species of *L. saxatilis* and it is to be hoped that the present differences in interpretation of some of these sub-specific names will be eventually reconciled.

Crepidula fornicata (L.). Arnold, 1960 (*Nature* **186**: 95), records the occurrence of full-grown single individuals at Kilmakilloge Harbour, on the southern shore of the estuary of the Kenmare River, Co. Kerry, in May 1959, and suggests that they had reached that locality attached to vessels previously laid up in British harbours. This would appear to be the first Irish record of this species.

Ranella olearium (L.). Dell & Dance, 1963 (*Proc. malac. Soc. London* **35**: 159), have established this as the correct name for the species usually known previously as *Gyrina gigantea* (Lamarck). Their dating of the name *Ranella* from Lamarck, 1816 is, however, incorrect, as it was first used by Bruguière, 1797 (*Encyclopédie Méthodique, Vers*, pls. 412–413). Fortunately this ante-dating does not affect the question of the type-species, which remains *R. gigantea* by subsequent monotypy, as Bruguière used the name only as a caption to his plates and included no nominal species.

Polycera elegans (Bergh). Edmunds, 1961 (*Proc. malac. Soc. London* **34**: 316–321), records this addition to the British nudibranch fauna from Plymouth. A comparison is made with Mediterranean forms of this species, and with *P. atlantica* Pruvot-Fol and *P. messinensis* Odhner. Edmunds concludes that these are all synonymous. The ecology of *P. elegans* is discussed and explanations are suggested to account for its rare occurrence.

Swennen, 1961 (*Netherlands J. Sea Res.* **1**: 191–240), has published an account of the distribution, reproduction and ecology of those nudibranchiate molluscs occurring in the Netherlands. As all but one of the thirty species considered are also found on our coasts, this work will be of considerable interest to the British worker on this difficult group. The bibliography contains some 67 references, providing some measure of the wide scope of Swennen's investigations.

Mytilus galloprovincialis Lamarck. There is still disagreement about the status of this species in British waters. Mrs. S. M. Turk reports it as occurring singly on rocks at Daymer Bay, N. Cornwall, and has procured eight specimens for the Voucher collection. I have not yet seen these specimens, but I am informed that "they show the purple-black mantle fringe and typical shape" (S.M.T., *in litt.* 16.x.1963). At a meeting of our Society last year, the President, Mr. L. W. Stratton, exhibited some shells of *M. galloprovincialis* recently taken in fresh condition from Weston shore, Southampton Water, and now in his collection, which also contains live-collected material of this species from the Gann estuary, Dale, Pembrokeshire. Mr. T. E. Crowley has also contributed specimens from Moulin Huet, Guernsey, C.I. I should be very pleased to receive more live-collected material of this disputed species for the Voucher collection.

Epilepton clarkiae (Clark). Deroux, 1961 (*Cahiers Biol. mar.* **2**: 99–153), established a new genus *Potidoma* for a small bivalve commensal with the polychaete worm *Polyodontes maxillosus* Ranzani and identified by Deroux as *Lepton subtrigonum* de Folin & Perrier *ex* Jeffreys MS. After an excellent comparative study of the shell and anatomy of several small species commonly referred to the Erycinacea, the author concludes that *Potidoma subtrigonum* and *Epilepton clarkiae* are congeneric and, accordingly, transfers *E. clarkiae* to his new genus. Both are then referred to the family MONTACUTIDAE. Deroux argues that, as the genus *Epilepton* has been placed in the NEOLEPTONIDAE and that family removed from the Erycinacea to the Cyamiacea, the fact that *E. clarkiae* is an undoubted member of the MONTACUTIDAE warrants its inclusion in a new genus. This argument is, of course, fallacious, since *E. clarkiae* is the type-species of *Epilepton*; if, therefore, *E. clarkiae* proves to be a montacutid, the genus *Epilepton* must be transferred back to the Erycinacea where it is available for the reception of *Lepton subtrigonum* too. *Potidoma* then becomes a subjective synonym for any worker who considers these two species congeneric.

Cerastoderma lamarcki (Reeve). The Recorder is making a special study of the variation of the edible cockle, *C. edule* (L.), and would particularly like to receive study material from brackish-water or salt-marsh localities. The brackish-water cockle has a thinner, more elongated shell than typical specimens from a marine habitat, and the juveniles are often found attached to the vegetation (usually *Chaetomorpha* or *Ruppia*) by a byssus. This form, which may be a distinct species and which is commonly referred to as *C. e. lamarcki*, was collected by some Members attending the field meeting at East Tilbury, Essex, in July 1963.

Petricola pholadiformis Lamarck. Duval, 1963 (*Proc. malac. Soc. London* **35**: 89), gives a map of the present British distribution of this species, including several hitherto unpublished records. It is now known from Mablethorpe, Lincolnshire, to Poole Harbour, Dorset. In the conchological collection of Truro Museum are six specimens of *P. pholadiformis* collected alive at Falmouth between 1891 and 1910 by Mrs. A. de B. Knocker. The early date of collection of these specimens is of particular interest, in so far as the first British record of this species was in July 1890 by Crouch from the River Crouch, Essex (*Proc. malac. Soc. London* **2**: 134–135). The Falmouth specimens would tend to corroborate the hypothesis that this American species* was accidentally introduced into this country along with imported American oysters [*Crassostrea virginica* (Gmelin)], as there is an extensive oyster fishery in the estuary of the R. Fal. A seventh specimen, of the same provenance, is now in the Voucher collection at the British Museum (Natural History) [B.M.(N.H.) reg. no. 196281]. Thanks are again due to Mrs. S. M. Turk for drawing attention to this material.

* It should be noted, however, that *P. pholadiformis* is recorded from West Africa from the Pleistocene to the present day. For an excellent survey of the known distribution of this species, and its introduction into Europe, see Dutertre, 1924 (*Bull. Soc. acad. Boulogne-sur-Mer* **11**: 1–23).

Pharus legumen (L.). Yonge, 1959 (*J. mar. biol. Ass. U.K.* **38**: 277–290), from an investigation of the anatomy of this species, concludes that its affinities are with the Tellinacea rather than with the Solenacea. To quote Yonge: “Major evidence for this decision comes from the separation of the siphons which are composed exclusively of the inner folds of the mantle margin and have the highly characteristic internal structure of those of the Tellinacea, the absence on the ctenidia of dorsal oralward currents and of the small frontal cilia, both characteristic of the Solenacea, and finally from the nature of the stomach with its small postero-dorsal caecum and the deep penetration into the foot of the mid-gut. The major difference from the Tellinacea generally is the absence of a cruciform muscle.”

Architeuthis Steenstrup. Stephen, 1962 (*Proc. roy. Soc. Edinb. (B)* **68**: 147–161) discusses the species of *Architeuthis* inhabiting the North Atlantic, and concludes that the two species represented on the European side of that ocean are *A. dux* Steenstrup and *A. clarkei* Robson. *A. monachus* Steenstrup is considered a synonym of *A. dux*. A table of the principal characters of the four North Atlantic species is provided, and particulars are given of some Scottish specimens referred to *A. dux*.

Sepia officinalis L. In the 1951 additions and corrections to Winckworth's “List”, it is stated that the two so-called sub-species *S. o. fischeri* Lafont and *S. o. filliouxii* Lafont are not separable from each other. Now Denton, from a study of the change in the form of the cuttlebone throughout the year, has established that *S. o. filliouxii* is but a seasonal variant of *S. o. officinalis* (Reported in *J. mar. biol. Ass. U.K.* **43**: 823).

Sepiola intermedia Naef and *S. aurantiaca* Jatta. Records of these two cephalopods from the Clyde Sea Area are given by Allen in the Fauna List referred to above. The former was not noted by Stephen, 1944 in his very useful paper on the Cephalopoda of Scottish and adjacent waters (*Trans. roy. Soc. Edinb.* **61**: 247–270), while Scottish records of the latter species are considered by Stephen to be referable to *S. pfefferi* Grimpe.

Exotic shells. Not infrequently, exotic shells, mostly West Indian in origin, are picked up on our beaches. The following are among those recently to come to my notice. A singleton of the large, Lusitanian chiton *Callochiton fulvus* (Wood) was dredged some years ago from the R. Fal, Cornwall (Baird, 1955. *Nature* **175**: 954). The recorded range of this species is Portugal, Spain and South America. Major P. K. Earle has recently collected a specimen of the West Indian *Donax denticulata* L. from Studland Bay, Dorset, in a condition so fresh that the remains of the animal were still within the shell. This specimen was displayed at the Annual General Meeting together with a single valve of the West African *Donax rugosa* L. collected in 1944 at Lelant beach, near St. Ives, Cornwall, by Miss M. G. Hocken and now also in Major Earle's collection. A second valve of the latter species, of the same provenance, is in the Truro Museum collection and was kindly communicated for my inspection by Mrs. S. M. Turk. I would assign

both of the St. Ives specimens to the variety *interrupta* Deshayes. *D. rugosa* is the type-species of *Donax* L.; it is the *Donax denticulata* Pennant *non* Linnaeus.

Would Members please note that the Recorder has now moved to the Dept. of Zoology, The University, Glasgow, W.2, and that material intended for the Voucher collection should be sent to the new address. After authentication and recording, the specimens will be forwarded to the British Museum (Natural History) for safe keeping.

DAVID HEPPELL

**813th Meeting, held at the British Museum (Natural History),
21 March 1964**

Mr. C. P. Castell, Vice-President, in the chair.

Member Deceased

The chairman reported the death of the Revd. Canon Laurence William Grensted, M.A., D.D.

Members Elected

John G. Evans, B.Sc., Highthwaite, Stony Lane, Little Kingshill, Great Missenden, Bucks.

Mrs. Marjorie Fogan, B.Sc., The Oaklands, 181 New Brook Road, Atherton, Manchester.

Mrs. Helen Peeters, 10 Avenue Venneborg, Deurne, Antwerp, Belgium.

Mrs. Glenda Cobb Sanders, 316 Bercliff Drive, South Bend 15, Indiana, U.S.A.

Malcolm C. Wyatt, B.Sc.(Econ.), 210 High Street, Uckfield, Sussex.

Communications

"Review of the genera and subgenera of living Cypraeidae," by W. O. Cernohorsky.

"*Aspatheria (Spathopsis) bourguignati* (Bourguignat): a new locality," by T. E. Crowley.

"The discovery of two specimens of *Conus gloriamaris* Chemnitz in Rabaul, New Britain," by C. E. Holland, with additional notes by M. R. Hayes.

"The British species of *Spisula*," by R. M. van Urk.

Exhibits

Special exhibit: *Terebra*, introduced by Mr. L. C. Prebble; examples were also shown by Mr. C. P. Castell (from the British Museum collections) and Mr. R. P. Scase, who also exhibited a shell of *Australium andersoni* dredged off East London, South Africa.

**814th Meeting, held at the British Museum (Natural History),
11 April 1964**

The President, Dr. M. P. Kerney, in the chair.

Members Elected

Charles Geerts, 28 avenue Bertaux, Bruxelles 7, Belgium.

John David Taylor, B.Sc., F.G.S., Department of Geology, King's College, Strand, London, W.C.2, and 19 Wavell Drive, Woodlands, Malpas, Newport, Monmouthshire.

J. T. Whitehouse, 145 Colehall Lane, South Yardley, Birmingham, 33.

Communication

"On *Limicolariopsis d'hericourtiana* (Bourguignat)," by T. E. Crowley and T. Pain.

Exhibits

Special exhibit: Paryphantidae, introduced by Mr. L. W. Stratton; examples were also shown by the Revd. Canon C. T. Cribb and Mr. T. Pain. Mr. C. P. Castell exhibited a block of Carboniferous limestone from Ulverston with perforations supposedly caused by *Helix* (*Geologist* 7: 42).

815th Meeting, held at the British Museum (Natural History) 23 May 1964

The President, Dr. M. P. Kerney, in the chair.

Members Elected

M. R. Block, B.Sc., 12 Willow Road, Tadley, Basingstoke, Hampshire.

S. M. Evans, B.Sc., 41 Rockland Road, Downend, Bristol.

Ian T. Guest, P.O. Box 387, Whangarei, Northland, New Zealand.

Miss Diana Jackson, 20 Elvaston Place, London, S.W.7.

Mrs. Hildegard H. E. Nash, 3A Whitehouse Common Road, Sutton Coldfield, Warwickshire.

Miss Alison Rutherford, The Cottage, Camiseskan Farm, Helensburgh, Dunbartonshire.

Communication

"Mollusca collected at Split, Yugoslavia," by Miss June Chatfield.

Exhibits

Special exhibit: newly recognised British species of non-marine Mollusca, introduced by the President; specimens and literature were also shown by Mr. C. P. Castell and Mr. A. E. Ellis. Special mention is made of *Hydrobia neglecta* Muus, 1963, collected by Dr. T. Warwick at Loch an Strumore, North Uist, the first British record [see *Proc. Malac. Soc. Lond.* 35: 131].

Mr. T. Pain: *Saulea vitrea* (Born), W. Africa, and an undescribed Miocene *Saulea* from Kenya.

Mr. R. P. Scase: some rare or recently described cowries, including *Cypraea dayritiana* Cate, *C. summersi* Schilder, *C. raysummersi* Schilder, *C. hammondae* Iredale and *C. isabellamexicana* Stearns.

Mr. G. W. Pitchford: maps showing the distribution of *Theba pisana* (Müller) in Guernsey.

Mr. G. Noel Smith: marine shells from Goodrington, S. Devon.

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MSS. should be typed, or legibly written, on quarto or foolscap paper, on one side of the sheet only, the lines double or treble spaced, with an ample margin on the left-hand side, each folio numbered in arabic numerals at the top right-hand corner. Footnotes should be avoided, but where absolutely essential should be enclosed in square brackets in the text following the passage to which they refer, "f.n." being inserted in the margin. The position of text-figures, graphs and tables should be indicated in the margin. Authors should retain a copy of their paper, the top copy being sent for printing.

Conventions to be observed: single underlining indicates *italic* face, double underlining SMALL CAPITALS, triple underlining LARGE CAPITALS, and wavy underlining bold or **Clarendon type**. Numerals should be arabic, not roman. The title of the paper is in bold capitals, the author's name in roman capitals. When undecided, leave choice of type to the Editor.

MSS. must be submitted in finalized, fully revised and corrected form; proof corrections are expensive and should be restricted to typographical errors. It is a function of the Editor to maintain a standard of uniformity in the presentation of papers published in the *Journal*, and authors who submit papers implicitly acquiesce in his discretion in such matters; they are recommended to study the arrangement and conventions observed in previous numbers.

References must be cited at the end of the paper in alphabetical order of authors' names. In the text, the author's name, date, and page number if appropriate are cited in parentheses.

The bibliographical references at the end are arranged as follows:

1. Author's name in small capitals, followed by initials; names of joint authors connected by ampersand (&).
2. Year of publication; if there is more than one publication by the same author in one year add *a*, *b*, etc.
3. Quote the *full* title of the paper or book, in the latter case underlined; use initial capitals for the first word, for proper names, geographical names, geological divisions, and taxonomic names above the rank of species (in German nouns have an initial capital).
4. The name of the periodical or journal in which the paper is published should be abbreviated according to the *World List of Scientific Periodicals*, or if brief cited in full, and underlined.
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6. Where the reference is to a book, the place of publication should be added.

Explanation of plates follows References. Legends for text-figures and plates should be provided on separate sheets, not on the reverse of the pictures.

Examples of references:

- BARNARD, K. H., 1962. Revised list of South African Late Tertiary and Pleistocene marine Mollusca. *Trans. roy. Soc. S. Afr.* **36**: 179-196.
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MONOGRAPH OF THE BRITISH LOWER TERTIARY UNIONIDAE, WITH DESCRIPTIONS OF THREE NEW SPECIES

By F. R. WOODWARD

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(Read before the Society, 18 January 1964)

INTRODUCTION

The first British Lower Tertiary freshwater mussel, *Unio solandri*, was described by JAMES DE CARLE SOWERBY in 1826, and two further species, *U. austeni* and *U. gibbsii* were described by MORRIS (1856). These three species were redescribed by S. V. WOOD (1864), together with five further forms, in his monumental monograph of the Eocene Mollusca. Since then, except for brief species lists, the British Lower Tertiary Unionidae had remained unworked. During this time further material has become available, resulting in the need for a revision of the group. From a biological standpoint the ideal method would be to compare the British representatives with those found in contemporaneous deposits throughout the world but, owing to the difficulties of obtaining sufficient comparative material, this method proves impracticable. For this reason it has become necessary to monograph the British species in the hope that at some future date a more comprehensive comparison can be made with species from Europe and North America.

Variations in freshwater mussels are considerable, hence numerous genera, often having ill-defined lines of distinction, have been erected for their reception, but until our knowledge of the relationships of the British examples becomes more complete, the author feels it advisable to place them in the genus *Unio* sensu lato.

The systematic descriptions of the British species, as given by WOOD (1864), prove inadequate for the identification of the different species. It has, therefore, been necessary to redescribe them all, basing the descriptions on the original type material, together with further material collected since 1864. The stratigraphy of the British Lower Tertiary is shown in Table 1.

Table 1. Stratigraphy of the British Lower Tertiary (Lower Caenozoic)

PERIOD	STAGE	BRITISH FORMATIONS
Oligocene	Chattian	[Absent]
	Rupelian	? Bovey Tracy Plant Beds
		Upper Hamstead Beds
	Lattorfian	Lower Hamstead Beds
		Bembridge Marls
		Bembridge Limestone
		Osborne Beds
		Upper Headon Beds
		Middle Headon Beds
Eocene	Bartonian	Lower Headon Beds
		Barton Beds
	Auversian	Upper Bracklesham Beds
	Lutetian	Lower Bracklesham Beds (upper portion)
	Cuisian	Lower Bracklesham Beds (lower portion)
		Lower Bagshot Sands
	Ypresian	London Clay
	Sparnacian	London Clay Basement Beds
		Blackheath Beds (= Oldhaven Beds)
		Woolwich and Reading Beds
		Thanet Sands
	Thanetian	
	Montian	[Absent]

SYSTEMATIC DESCRIPTIONS

The following abbreviations are used to denote the collections in which the material is deposited:

- BM = British Museum (Natural History);
 GSM = Geological Survey and Museum, London;
 SM = Sedgwick Museum, Cambridge;
 FRW Coll. = F. R. Woodward collection.

The following abbreviations are used in giving the measurements of the specimens examined:

- L. = antero-posterior length;
 B. = breadth;
 H. = height;
 Hu. = height at umbo;
 Hm. = maximum height.

Family UNIONIDAE Fleming, 1828

Genus UNIO Philipsson, 1788

Type species: *Mya pictorum* L. (ICZN Opinion 495)

Shell inequilateral, oval to elongated; rounded anteriorly, pointed or bi-angulate posteriorly with a more or less developed gonial ridge; ventral margin often becoming arcuate in old age. Surface smooth, slightly concentrically ridged or pustulose; periostracum generally dull. Umbones only moderately full, generally sculptured with coarse ridges which run parallel to the growth lines, or which are somewhat doubly looped, sometimes broken, and showing fine radiating lines behind;

umbonal cavity not deep nor compressed. Hinge plate narrow; two pseudocardinal and two lateral teeth in the left valve, and one pseudocardinal and one lateral in the right with, rarely, a vestige of a second lateral.

***Unio austeni* Morris, 1856**

(Pl. 23, fig. 5)

Unio austeni Morris, 1856: 147, pl. 2, fig. 7.

Unio austeni. WOOD, 1864: 133, pl. 20, fig. 12.

Description. Shell equivalve, markedly inequilateral; umbones anteriorly situated, at a point approximately one-seventh of the way along the length of the shell. Gonial ridge well marked, the post-gonial region being relatively wide. Growth lines well marked. Anterior margin obliquely inclined and passing into the curved anterior-ventral margin at a point bisecting the height of the shell; ventral margin concave, as a result of the faint median sinuosity; posterior margin truncated; dorsal margin straight, tending to run parallel to the ventral margin. Umbones slightly elevated, inclined forwards over a weakly developed lunule; sculptured with three or four fine, **W**-shaped rugae. Traces of ligament present, being partially concealed by the alate post-umbonal region of the valves.

The holotype shows evidence of a distinct lateral lamella in the left valve, whilst the two paratypes show that the left valve had two pseudocardinals; unfortunately, nothing is known of the right valve or of the musculature.

Geological horizon. Upper Eocene: Lower Headon Beds (FRW). Oligocene: Hamstead Beds (MORRIS).

Material examined

Holotype: GSM 58058. Type locality: Hamstead, Isle of Wight.

Two paratypes: GSM 59059 and 59060.

A specimen which is presumably this species, obtained from the Lower Headon Beds of Colwell Bay in 1961, and now in the author's collection.

The species seems to be extremely rare in collections, the holotype, two fragmentary paratypes and the specimen in the author's collection being all that have been seen; the last having been found together with about one hundred specimens of *U. solandri*. This apparent rarity, however, is probably due to the true source of this species having been overlooked.

The dimensions of the holotype are as follows:

L. 34.0mm. B. 8.0mm. Hu. 20.0mm.

The two paratypes consist of fragments which are unsuitable for measuring.

The dimensions of the specimen in the author's collection are as follows:

L. 35.0mm. B. 10.0mm. Hu. 20.0mm.

Unio brightoni n. sp.

(Pl. 22, fig. 2)

Unio sp. KEEPING, 1910: 436.*Unio* sp. BURY, 1934: 68.*Unio* sp. nov. ARKELL, 1947: 240.

Description. Shell equivalve, strongly inequilateral, inflated, elongate oval in outline; umbones slightly elevated, situated two-ninths of the way along the length of the shell. Gonial ridge weakly developed; shell broader and higher posterior to umbones. Growth lines weakly indented. Anterior margin produced, rounded; ventral margin curved and at an angle to the dorsal margin; posterior margin roundly truncated; dorsal margin slightly curved, being slightly alate posterior to the umbones. Umbones eroded, yielding no trace of umbonal sculpturing which may or may not have been present. No trace of ligament present. The internal features are unknown.

Geological horizon. Oligocene: Creechbarrow Beds (=Bembridge Limestone).

Material examined

Holotype: SM C.9967. Type locality: Creechbarrow Hill, $2\frac{1}{2}$ miles west of Corfe Castle, Dorset.

The dimensions of the holotype are as follows:

L. 32.25mm. B. 12.0mm. (approx.) Hm. 19.25mm.
Hu. 16.0mm.

The holotype is strongly reminiscent of the Recent genus *Anodonta* sensu lato in outline, and further examples showing the hinge plate may prove this to be its proper systematic position. The shell appears to be relatively thick, however, as in the genus *Unio*, so it is proposed to retain this new species in *Unio* sensu lato until further material can be obtained.

Unio brightoni is so far known only from the unique type, although the block of limestone in which the specimen occurs shows evidence of a further example, suggesting that the species may have been fairly abundant. Associated with it are the characteristic Bembridge Limestone land snails *Filholia elliptica* (J. Sowerby) and *Megacochlea globosa* (J. de C. Sowerby). The similarity of this fauna to that of the Bembridge Limestone has been accepted as evidence that the two deposits are of the same age. It is surprising, therefore, that fossil unionids have not been discovered in the Bembridge Limestone of the Isle of Wight, although MANTELL (1854: 79) records the presence of a small *Unio* in the limestones of Binstead in association with *Planorbis euomphalus* J. Sowerby, *Lymnaea longiscata* (Brongniart) and *Filholia elliptica*, thus proving he was referring to the Bembridge Limestone. Unfortunately a visit by the author to the Binstead locality proved fruitless, since the quarry had not been worked for a considerable number of years and had been filled in, thus obliterating what may have proved to be a second locality for *U. brightoni*.

This species is named after Mr A. G. BRIGHTON, curator of the Sedgwick Museum, Cambridge, for his considerable help in the loan of material during this investigation.

Unio cumberlandi n. sp.

(Pl. 23, figs. 3-4)

Description. Shell equivalve, markedly inequilateral, the anteriorly situated umbones occurring at a point one-fifth of the way along the length of the shell. Gonial ridge well marked, rounded. Dorso-gonial region traversed by a series of distinctive corrugations radiating from the umbonal region of the shell, the remainder of the disc being smooth. Growth lines weakly developed. Anterior margin rounded, not extending as far anteriorly as in *U. solandri*; posterior margin roundly truncate; dorsal margin virtually parallel to the ventral margin. Umbones elevated, inclined forwards over a weakly developed lunule; umbonal rugae consisting of a series of strongly developed **W**-shaped ridges. Ligament still present, being slightly elevated above the dorsal margin.

A fragmentary left valve shows the shell to be of uniform thickness, with the hinge possessing one lateral lamella in the left valve (hence two in the right?). The pseudocardinals appear to have been weakly developed, but are badly preserved in the material at hand. The anterior adductor and retractor-pedis scars are fused, whilst the protractor-pedis scars remain distinct.

Geological horizon. Upper Eocene: Lower (?) Headon Beds.

Material examined

Holotype: Birmingham Museum [G.97.64]. Type locality: Colwell Cliff, Isle of Wight, 200 yds to NE. of path down to beach (FRW 1961).

Five paratypes: BM LL 17669, SM C.54264, and three specimens in FRW Coll.

The dimensions of these specimens are as follows:

	SPECIMEN	L.	B.	Hm.
Holotype	Birmingham Museum G.97.64	34.0mm.	12.5mm.	15.0mm.
Paratype	BM LL 17669	36.0mm.	16.0mm.	18.5mm.
Paratype	SM C.54264	36.0mm.	14.0mm.	16.0mm.
Paratype	FRW Coll.	35.0mm.	21.0mm.	15.0mm.
Paratype	FRW Coll.	25.0mm.	13.0mm.	17.5mm.
Paratype	FRW Coll.	25.0mm.	5.0mm.*	14.0mm.

* = one valve.

This species is named after Mr R. F. CUMBERLAND as a token of appreciation of his photographic contributions to the study of Mollusca, both fossil and Recent.

Unio edwardsii Wood, 1864

(Pl. 22, fig. 1)

Unio edwardsii Wood, 1864: 133, pl. 20, figs. 16a, 16b.*Unio edwardsii*. NEWTON, 1891: 29.

Description. Shell equivalve, markedly inequilateral, thick, inflated, elongate oval in outline, resembling the Recent *Unio tumidus* Philipsson; umbones slightly elevated, situated about one-fifth of the way along the shell. Gonial ridge weakly developed, gently rounded. Growth lines well marked, in the form of raised ridges. Anterior margin convex, commencing from directly beneath the umbo; ventral margin straight or slightly curved anteriorly, distinctly curved posteriorly; posterior margin obliquely truncate and continuous with the slightly curved dorsal margin. Umbones eroded, with no evidence of umbonal sculpture; the lectotype, however, has a distinct median sinuosity. No trace of the ligament present in the material examined.

Left valve with two pseudocardinals, the posterior being the larger; right valve with a single pseudocardinal; lateral teeth well developed. Muscle scars impressed; anterior adductor scar roundly quadrangular, fused with the anterior retractor-pedis scar; anterior protractor-pedis scar distinct, elongate oval in outline; pallial scars fused, forming a distinct pallial line running from the anterior adductor to the posterior adductor scar; posterior adductor scar roundly oblong, occupying approximately twice the surface area of the anterior adductor scar, and fused with the posterior retractor-pedis scar. The nacreous layer has radiating grooving as in *U. gibbsii*.

Geological horizon. *U. edwardsii* is apparently confined to the Woolwich Beds of the Lower Eocene.

Material examined

Lectotype (internal cast): BM LL 17671. Type locality: Peckham.

Paralectotype: BM LL 17672.

Specimens from the following localities: Peckham, London [BM 72607]; Effra Branch Sewer, Peckham, London [SM C.14544-5]; Bromley, Kent [SM C.14546].

The dimensions of the paralectotype were not taken, since the shell is partly embedded in matrix.

The dimensions of the other material are as follows:

	SPECIMEN	L.	B.	H.
Lectotype	BM LL 17671	55.0mm.	6.0mm.*	29.25mm.
	SM C.14544	49.0mm.	10.0mm.*	24.0mm.
	SM C.14545	63.0mm.	?	20.0mm.

* = one valve.

Unio gibbsii Morris, 1856

(Pl. 24, fig. 6 and pl. 25, figs. 7-10)

Unio gibbsii Morris, 1856: 147, pl. 2, fig. 6.*Unio gibbsii*. WOOD, 1864: 133, pl. 20, fig. 14.*Unio vectensis* Wood, 1864: 136, pl. 20, fig. 15.*Unio tumescens* Wood, 1864: 136, pl. 20, figs. 17a, 17b.[Non *Unio tumescens* Lea, 1845. *Proc. Amer. phil. Soc.* 4: 164 = *Quadrula tumescens* (Lea).]*Unio tumescens* (?) var. *headonensis* Wood, 1864: 136, pl. 20, fig. 19.*Unio gibbsii*. NEWTON, 1891: 29.*Unio gibbsii* (?) var. *headonensis*. NEWTON, 1891: 29.*Unio tumescens*. NEWTON, 1891: 30.*Unio vectensis*. NEWTON, 1891: 30.

This species was first described by MORRIS in 1856 and later by S. V. WOOD in his monograph of the Eocene Mollusca, together with his new species *tumescens* and *vectensis*. On examination, the respective types were found to be conspecific; thus WOOD's names become junior synonyms of *U. gibbsii* Morris.

Description. Shell thick, equivalve, inequilateral, inflated; umbones slightly elevated, situated approximately one-fourth of the way along the shell. Posterior gonial ridge not strongly developed. Growth lines well marked, showing the shell to be rounder in the younger stages. In some examples the outer shell layers have peeled off exposing the nacreous layer, which bears distinct radiating lines from the umbones to the ventral margin.* Anterior margin slightly produced, rounded; ventral margin slightly convex, not parallel to dorsal margin; posterior margin oblique, roundly truncate; dorsal margin slightly convex. Umbones inconspicuous or slightly elevated, inclined forwards over a weakly developed lunule; umbonal sculpture missing in the majority of examples, owing to the badly preserved condition, but in the holotype three or four fine, irregular, broken ridges are present on the umbo. Ligament black, strongly developed externally, thick, still persisting in the majority of examples.

The pseudocardinals in the left valve are fused to form a very low, elongate, heavily sulcated ridge with a weakly-developed sulcated notch, into which fits the single, massive, heavily-sulcated, obscurely-triangular pseudocardinal of the opposing right valve. Interdentum poorly

* It is highly probable that this sculpture is a result of weathering, although JUTTING (1937: 154) records that similar ribs are discernable on the anterior third of shells of the Javanese freshwater mussel *Pseudodon vondembushianus* (Lea) when viewing the shell against a very strong light.

developed. Laterals well developed, slightly curved, extending over posterior muscle scar; they are single in the right valve, double in the left, and are strongly striated on their articulating surfaces, the striations running at an angle antero-posteriorly. Umbonal cavities deep, normally with two dorsal muscle scars impressed on the hinge plate.

The other muscle scars are as follows: anterior adductor scar deeply impressed and anterior to pseudocardinals; anterior protractor-pedis scar situated on the anterior margin of the pseudocardinal tooth, separated from the anterior adductor scar by a weak or partially developed nacreous ridge; anterior protractor-pedis scar usually separate, deeply impressed, and elongate oval in outline, tending to be contiguous with the anterior adductor scar in old shells; posterior adductor scar deeply impressed, distinct, separated from the deeply impressed, roundly-triangular, posterior retractor-pedis scar, which is situated on the inner face of the lateral tooth.

Nacre iridescent, with a pinky coloration which may be due to staining by post-depositional agencies such as solutions of iron salts.

Geological horizon. Oligocene: Bembridge Limestone.

Material examined

Holotype of *U. gibbsii*: GSM 108546. Type locality: Hempstead [i.e. Hamstead] Cliff.

Holotype of *U. vectensis*: BM LL 17675. Type locality: Headon Hill, Isle of Wight (on the authority of EDWARDS).

Lectotype of *U. tumescens*: BM LL 17673. Type locality: Headon Hill, Isle of Wight (on the authority of EDWARDS).

Paralectotype of *U. tumescens*: BM LL 17674.

Holotype of *U. tumescens* var. *headonensis*: BM 72605. Type locality: Headon Hill (on the authority of EDWARDS).

SM C.24391 and SM C.29450, from Headon Hill; SM C.24392; three specimens in FRW Coll., also from Headon Hill.

On a visit by the author to Headon Hill in June 1961, in company with Mr T. PAIN and Mr M. GOODCHILD, one of us (M.G.) had the good fortune to obtain a fragmentary example of this species from the sandy Headon Beds immediately beneath a hard sandstone seam containing *Viviparus*. Evidence of other examples was observed, but there was insufficient time to examine the exposure in detail. It is important, however, to note that this species occurred in a sandy deposit and was, apparently, the only species present. The horizon at which this deposit occurred appears to be higher than the beds of the Colwell Bay exposures. This specimen was obtained about half-way up the cliff at the first Headon Hill outcrops, just past the house on the Colwell Bay side of Headon Hill cliff.

The holotype of *U. vectensis* Wood [BM LL 17675] proves to be an abnormal specimen of *U. gibbsii* in which growth has been more rapid in a ventral direction, the resultant shell having a rounded outline. WOOD

figured a further variation of *U. gibbsii* as *U. tumescens* var. *headonensis*, his figure being based upon a solitary specimen obtained by EDWARDS from Headon Hill [BM 72605]. A careful comparison of the holotype of *U. tumescens* var. *headonensis* with the lectotype of *U. tumescens* shows them to be conspecific, as WOOD suspected, his variety being based on an abnormal individual in which the posterior margin has undergone stunting, possibly as a result of inhabiting an area in which the flow of water was relatively fast.

The dimensions of the specimens measured are given in Table 2.

Table 2. *Unio gibbsii* Morris. Dimensions of specimens

SPECIMEN	L.	B.	H.	
GSM 108546	39.0mm.	18.0mm.	25.0mm.	Holotype of <i>U. gibbsii</i>
BM 72605	46.0mm.	17.0mm.	26.0mm.	Holotype of <i>U. tumescens</i> var. <i>headonensis</i>
BM LL 17673	35.0mm.	8.0mm.*	24.0mm.	Lectotype of <i>U. tumescens</i>
BM LL 17674	45.0mm.	8.0mm.	26.0mm.	Paralectotype of <i>U. tumescens</i>
BM LL 17675	39.0mm.	19.75mm.	24.0mm.	Holotype of <i>U. vectensis</i>
SM C.24391	36.0mm.	10.0mm.*	28.0mm.	
SM C.24392	28.0mm.	7.5mm.*	20.0mm.	
SM C.29540	46.0mm.	18.0mm.	26.0mm.	
FRW Coll.	40.0mm.	19.0mm.	23.0mm.	Collected M. GOODCHILD, 1961
FRW Coll.	40.0mm.	18.0mm.	22.0mm.	
FRW Coll.	32.0mm.	14.0mm.	20.0mm.	

* = one valve.

Unio michaudi Deshayes, 1860

(Pl. 26, fig. 11)

Unio michaudi Deshayes, 1860*: 802, pl. 62, figs. 1–5. [Type locality: Cuis.]

Unio michaudi. WOOD, 1877: pl. A, fig. 6.

Description. Shell equivalve, inequilateral, rhombic in outline, relatively thin; umbones slightly elevated, situated two-sevenths of the way along the shell. Gonial ridge weakly developed, rounded. The regular growth lines are raised and impressed on the internal mould, indicating that the shell was relatively thin as in *Anodonta*. Anterior margin slightly produced, rounded; ventral margin slightly curved, parallel to dorsal margin; posterior margin abruptly truncated; dorsal margin straight, weakly alate posterior to the umbones.

Traces of the ligament persist on the dorsal margin. The shell remnants in the hinge plate region show traces of two slightly raised elongate ridges which possibly represent lateral teeth.

* Although p. 802 of volume 1 of the text of DESHAYES's *Descriptions des animaux* . . . was published in 1860, pl. 62 of volume 1 of the Atlas of plates was published in 1858. If the explanations of the plates were published with the plates, the species should date from 1858 rather than from 1860.

Geological horizon. Lower Eocene: Woolwich Beds.

Material examined

SM C.14543. Locality: Dulwich.

The dimensions of this specimen are as follows:

L. (of fragment) 59.0mm. B. (one valve) 8.0mm. H. 35.0mm.

The single British example of this species is in the Sedgwick Museum, Cambridge, and was originally labelled by J. C. MEYER as *U. solandri* J. de C. Sowerby, a species which does not extend as far back in time as the Woolwich Beds. WOOD (1877) provisionally identified this species as *U. michaudi* Deshayes and, since I have so far been unable to make direct comparisons between this specimen and authentic French material of DESHAYES' species, I have provisionally accepted WOOD's identification. I should like to point out, however, that in its general outline and thin shell the present species is strikingly similar to the Recent genus *Anodonta* and that further material may prove this to be its correct systematic position; if so, this would be the first record of *Anodonta* from the British Lower Tertiary.

***Unio nuttalli* n. sp.**

(Pl. 26, figs. 12-13)

Description. Shell equivalve, markedly inequilateral, relatively thin, inflated, elongate oval in outline, pale buff in colour; umbones slightly elevated, situated one-fifth of the way along the length of the shell. Gonial ridge weakly developed, shell broader and higher posterior to umbones. Growth lines distinct. Anterior margin produced, rounded; ventral margin relatively straight, at an angle to the dorsal margin and tending to have a median sinuosity; posterior margin roundly truncate; dorsal margin curved and continuing into the posterior margin. Umbones badly eroded, slightly raised; there is no evidence of shell sculpturing. Ligament persistent, dark brown in colour, slightly elevated, extending the length of the dorsal margin both anteriorly and posteriorly to the umbones. The internal features are unknown.

Geological horizon. Upper Eocene: Headon Beds.

Material examined

Holotype: BM LL 17676. Specimen purchased from R. ETHERIDGE, 1869. Type locality believed to be Hordwell.

Paratype: BM LL 17677.

The dimensions of these specimens are as follows:

SPECIMEN	L.	B.	Hm.	Hu.
Holotype	49.0mm.	15.0mm.	25.0mm.	20.0mm.
Paratype	51.0mm.	20.0mm.	28.0mm.	23.0mm.

U. nuttalli may readily be distinguished from *U. tumescens* by its more elongate shape, and from *U. solandri* and *U. cumberlandi* by its being thicker posterior to the umbones. In the general outline and erosion of the valves, the shell is reminiscent of the Hyridellidae but, since the internal features are unknown, this must remain in doubt until further material becomes available. The holotype and paratype are the only examples seen so far.

I have much pleasure in naming this species after Mr C. P. NUTTALL in appreciation of his help in placing the material at my disposal.

***Unio solandri* J. de C. Sowerby, 1826**

(Pl. 27, figs. 14–16)

Unio solandri J. de C. Sowerby, 1826: pl. 517.

Unio solandri. WOOD, 1864: 134, pl. 20, figs. 11a, 11b.

Unio solandri. NEWTON, 1891: 29

Description. Shell relatively thin, equivalve, inequilateral, approximately twice as long as high; umbones slightly elevated, situated about one-fourth of the way along the shell. Gonial ridge well defined, smoothly rounded. Growth lines well defined; the outer shell layer tends to flake, exposing the nacreous layer beneath. Ventral margin relatively straight, parallel to dorsal margin*; posterior margin rounded, bluntly truncated; dorsal margin straight, produced anteriorly to umbones, roundly truncated at the anterior margin. Umbones inconspicuous, inclined forwards over a weakly developed lunule; umbonal sculpture well defined, consisting of three to five strongly developed, double-looped, V-shaped ridges. The central embayment between these V-shaped rugae is continued as a slight furrow on the mature regions of the shell. Ligament small, not normally fossilized.

The internal characters which follow are based on a right valve in the British Museum (Natural History) [BM LL 17680] and a left valve in the author's collection. Right valve with a single, blunt, elongate pseudocardinal, which presents a W-shape when viewed from the dorsal aspect; and a single, thin, lamelliform lateral. Left valve with a single, flattened pseudocardinal and two lamelliform laterals. Umbonal cavity shallow, with a single dorso-umbonal scar on the anterior umbonal wall. The other muscle scars are fairly well impressed: the anterior adductor scar tends to be reniform and contiguous with the anterior retractor-pedis scar, which is deeply impressed upon the antero-ventral wall of the pseudocardinal tooth; anterior protractor-pedis scar distinct, well impressed and slightly reniform in outline; pallial scars fused, forming a distinct pallial line which is thickened in the posterior region immediately beneath the posterior adductor scar; posterior adductor scar impressed,

* In the majority of mature shells there is a slight embayment in the mid-ventral region; this may be a result of the continuation of the umbonal central sinus of the embryonic shell.

oval in outline, occupying approximately twice the surface area of the anterior adductor scar; posterior retractor-pedis scar triangular, contiguous with and situated on the dorso-posterior margin of the posterior adductor, ceasing anteriorly at the posterior margin of the lateral lamella. Nacre tinged with brown in the majority of examples examined.

Geological horizon. Upper Eocene: Lower Headon Beds. Oligocene: Headon and Osborne Beds. *U. solandri* is particularly abundant in the Lower Headon Beds of Colwell Bay, Isle of Wight, and also in those of Hordwell Cliff, in Hampshire, where it forms distinctive '*Unio* beds' up to three inches in thickness.

Internal casts of specimens from the Osborne Beds of Nettlestone, Isle of Wight, from the H. KEEPING collection [SM C.23764], are apparently this species, indicating that *U. solandri* persisted into the Osborne Beds and possibly later.

Material examined

Lectotype: BM LL 17678. Type locality: Hordwell Cliff.
Paralectotype: BM LL 17679.
Specimens from the following localities: Hordwell, Hants. [SM C.29530-3, C.30876-81]; Nettlestone, Isle of Wight [SM C.23764]; Headon Beds, Colwell Cliff, Isle of Wight, 200 yards to left of the path down to the beach (FRW 1961) [SM C.29529, C.29629-31, FRW Coll.].
BM LL 17670, LL 17680-82; SM C.28489, C.29492-3.
NEWTON (1891: 29) records *U. solandri* from Headon Hill, Isle of Wight.
The dimensions of some of this material are given in Table 3.

Table 3. *Unio solandri* J. de C. Sowerby. Dimensions of specimens

SPECIMEN	L.	B.	H.	
BM LL 17670	32.5mm.	4.0mm.*	14.5mm.	
BM LL 17678	45.5mm.	11.5mm.	20.0mm.	Lectotype
BM LL 17679	33.0mm.	7.0mm.	15.0mm.	Paralectotype
BM LL 17680	33.0mm.	5.0mm.*	17.0mm.	
BM LL 17681	40.0mm.	10.0mm.	18.0mm.	
BM LL 17682	39.0mm.	11.0mm.	17.5mm.	
SM C.28489	42.0mm.	13.0mm.	18.0mm.	
SM C.29492	44.0mm.	5.5mm.*	18.5mm.	
SM C.29493	37.0mm.	5.0mm.*	15.0mm.	
SM C.29529	37.0mm.	11.0mm.	16.0mm.	
SM C.29530	37.0mm.	12.0mm.	15.0mm.	
SM C.29531	36.0mm.	13.25mm.	17.75mm.	
SM C.29629	32.0mm.	?	14.0mm.	
SM C.29630	35.0mm.	?	17.0mm.	
SM C.29631	43.0mm.	?	18.0mm.	
SM C.30877	26.0mm.	4.0mm.*	12.0mm.	
FRW Coll.	31.0mm.	3.5mm.*	14.0mm.	
FRW Coll.	29.0mm.	3.5mm.*	14.5mm.	
FRW Coll.	28.5mm.	4.0mm.*	13.5mm.	

* = one valve.

***Unio subparallela* Wood, 1864 (ex Edwards MS.)**

(Pl. 27, fig. 17)

Unio subparallela Wood, 1864: 135, pl. 20, figs. 13a, 13b. [Non *Unio subparallela* Lea, 1872. *Proc. Acad. nat. Sci. Philad.* 2: 157 = *Elliptio complanatus* (Dillwyn).]

Unio subparallela. NEWTON, 1891: 29.

Description. Shell equivalve, inequilateral, elongate oval in outline, relatively thin; the outer layer is broken in the lectotype, exposing the nacreous layer which is traversed by radiating striae much finer and closer together than those present in *U. edwardsii* and *U. gibbsii*; umbones depressed, situated approximately one-fifth of the way along the length of the shell. Gonial ridge weakly developed, gently rounded. Growth lines distinct, regular, slightly raised. Anterior margin slightly produced, convex, the curvature commencing from immediately beneath the umbo; ventral margin straight or slightly curved, rounded posteriorly to meet the obliquely truncated posterior margin; dorsal margin straight, tending to be parallel to the ventral margin, meeting the posterior margin immediately above the commencement of the curve of the ventral margin. A specimen in the A. G. DAVIS collection [BM LL 17683] shows evidence of distinct umbonal sculpture in the form of strong, slightly wavy rugae, lying almost parallel to the lines of growth. No trace of ligament present. The internal features are unknown, except that the paralectotype shows two definite lateral lamellae.

Geological horizon. Lower Eocene: Woolwich Beds, 'Paludina Bed'.

Material examined

Lectotype: BM L 5698. Type locality: Counter Hill, Deptford.

Paralectotype: BM 72609.

BM LL 17683-6. Beddington, Surrey ex A. G. DAVIS.

BM LL 17688. Woolwich Beds, Peckham.

SM C.29532-3. Locality unknown.

The dimensions of some of these specimens are as follows:

	SPECIMEN	L.	B.	H.
Lectotype	BM L 5698	59.0mm.	5.0mm.*	28.0mm.
Paralectotype	BM 72609	35.5mm.	2.5mm.*	15.0mm.
	SM C.29532	45.5mm.	13.0mm.	22.5mm.
	SM C.29533	38.0mm.	10.0mm.	19.5mm.

* = one valve.

ACKNOWLEDGMENTS

I should like to express my thanks to the following for the loan of material: The Department of Palaeontology, British Museum (Natural History); The Geological Survey and Museum, London; Birmingham Museum and Art Gallery; Manchester Museum; The Sedgwick Museum, Cambridge. Thanks are also due to the following for helpful criticism and advice: Mr L. BILTON, Mr A. G. BRIGHTON, Mr C. P. CASTELL, Dr L. R. COX, Mr T. E. CROWLEY, Dr R. M. C. EAGAR, Mr C. P. NUTTALL, Mr T. PAIN. For photographs, I am indebted to the British Museum (Natural History) for those of *U. edwardsii*, *U. solandri*, *U. subparallela*, *U. tumescens*, *U. tumescens* var. *headonensis* and *U. vectensis*, and to Mr R. F. CUMBERLAND for the remainder. Finally I would like to thank my wife, ANN, and my mother for help in the preparation of the typescript.

SUMMARY

The British Lower Tertiary Unionidae are described and figured, and lectotypes are selected of *Unio edwardsii* Wood, *U. solandri* Sowerby, *U. subparallela* Wood and *U. tumescens* Wood. *U. tumescens* Wood, *U. tumescens* var. *headonensis* Wood and *U. vectensis* Wood are shown to be synonyms of *U. gibbsii* Morris. Three new species are described, viz *Unio brightoni*, *U. cumberlandi* and *U. nuttalli*.

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EXPLANATION OF PLATES

PLATE 22

- Figure 1. *Unio edwardsii* Wood: lectotype, right valve with nacreous layer exposed. Woolwich Beds. BM LL 17671.
Figure 2. *Unio brightoni* Woodward: holotype, right valve in Creechbarrow Limestone. Creechbarrow Beds (= Bembridge series). SM C.9967.

PLATE 23

- Figure 3. *Unio cumberlandi* Woodward: holotype, right valve. Lower (?) Headon Beds. Birmingham Museum G.97.64.
Figure 4. *Unio cumberlandi* Woodward: paratype, dorsal aspect showing umbonal rugae and characteristic gonial plications. Lower (?) Headon Beds. BM LL 17669.
Figure 5. *Unio austeni* Morris: holotype, left valve. Hamstead Beds. GSM 58058.

PLATE 24

- Figure 6. *Unio gibbsii* Morris: holotype, right valve. Headon Beds. GSM 108546.

PLATE 25

- Figure 7. *Unio gibbsii* Morris: holotype of *Unio tumescens* var. *headonensis* Wood, right valve. Headon Beds. BM 72605.
Figure 8. *Unio gibbsii* Morris: holotype of *Unio vectensis* Wood, right valve. Headon Beds. BM LL 17675.
Figure 9. *Unio gibbsii* Morris: lectotype of *Unio tumescens* Wood, right valve (exterior). Headon Beds. BM LL 17673.
Figure 10. *Unio gibbsii* Morris: lectotype of *Unio tumescens* Wood, right valve (interior).

PLATE 26

- Figure 11. *Unio michaudi* Deshayes: specimen figured by Wood, 1877. Woolwich Beds. SM C.14543.
Figure 12. *Unio nuttalli* Woodward: holotype, left valve. Headon Beds, Hordle. BM LL 17676.
Figure 13. *Unio nuttalli* Woodward: paratype, left valve. Headon Beds, Hordle. BM LL 17677.

PLATE 27

- Figure 14. *Unio solandri* Sowerby: lectotype, left valve (exterior). Lower Headon Beds. BM LL 17678.
Figure 15. *Unio solandri* Sowerby: lectotype, left valve (interior).
Figure 16. *Unio solandri* Sowerby: dorsal aspect showing umbonal rugae. Colwell Bay, 1961, F. R. WOODWARD. BM LL 17670.
Figure 17. *Unio subparallela* Wood: lectotype, right valve. Woolwich Beds. BM L 5698.



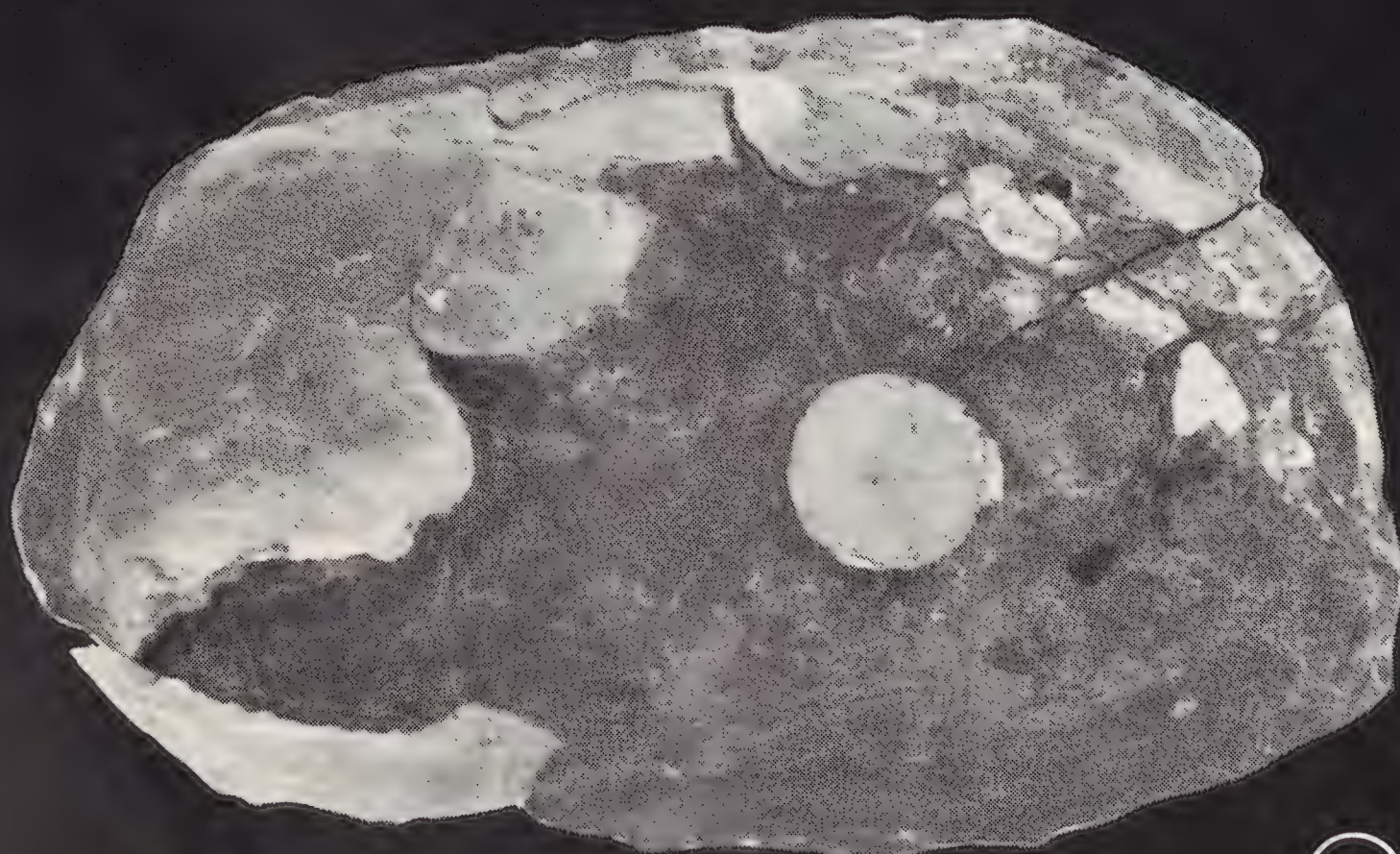
2. *Unio brightoni* Woodward



3



4



5

3, 4. *Unio cumberlandi* Woodward



Unio gibbsii Morris



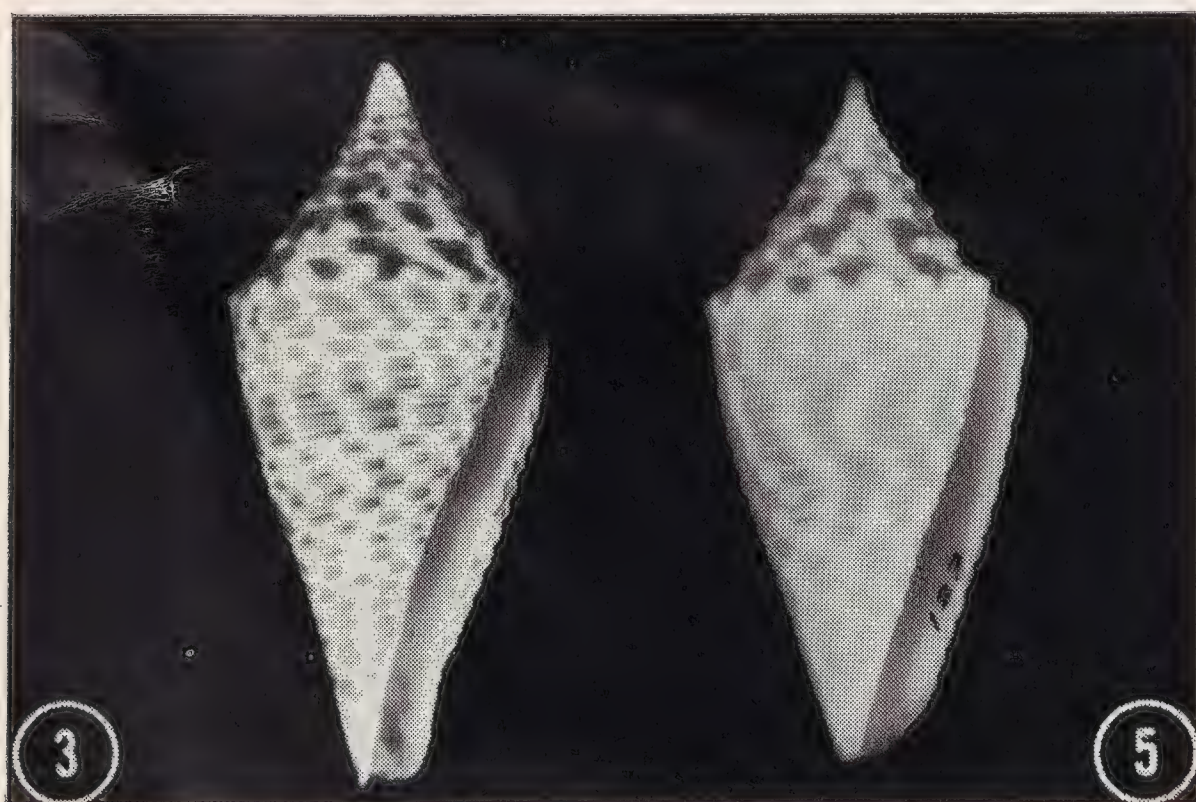
Unio gibbsii Morris



11. *Unio michaudi* Deshayes. 12, 13. *Unio nuttalli* Woodward



14-16. *Unio solandri* Sowerby. 17. *Unio subparallela* Wood



1, 2. *Conus parvulus* Link
3, 4. *Conus praecellens* Adams
5, 6. *Conus acutangulus* Lamarck

THE TAXONOMIC STATUS OF *CONUS IMPERATOR* (WOOLACOTT)

By WALTER O. CERNOHORSKY

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(Read before the Society, 17 October 1964)

SUMMARY

Conus parvulus Link, 1807, is the oldest available name for the species under discussion. *Conus roseus* Lamarck, 1810 (non *C. roseus* Fischer, 1807) and *Virroconus imperator* Woolacott, 1956, are both synonyms of *C. parvulus* Link. The species appears to have a restricted geographical distribution, ranging from western Melanesia to the northern part of Australia and to Indonesia.

The frequent appearance of *Virroconus imperator* Woolacott, 1956 in Australian conchological literature necessitates a review of the actual taxonomic value and status of the species. In order to appreciate the motive for altering the name of a well-known and long-established species, it is pertinent to quote the opening remarks of Mrs WOOLACOTT's paper:

'It is a very striking shell in appearance and would appear to have but one other which resembles it in any way, this is *Conus roseus* Lamarck, a West Indian shell. As *roseus* of LAMARCK has disappeared in the synonymy of *Conus regius cardinalis* Hwass (in) Bruguière (see CLENCH, 1942), and as the new species in no way resembles *Conus regius* or any varieties of *regius*, it is obvious that though they may appear similar in literature, they are not so in fact.'

Mrs WOOLACOTT accepted CLENCH's placing of *C. roseus* Lamarck in the synonymy of *C. regius cardinalis* Hwass in Bruguière without a query and presumed that the shell she named was confined to Australian seas. In reference to *C. roseus*, Mrs WOOLACOTT cited only LAMARCK's 1822 work (*Hist. nat. anim. sans vert.* 7), although the species had already been described by him in 1810 (*Annls Mus. Hist. nat.*, Paris 15: 37).

Conus roseus Lamarck was described by its author from 'les Antilles'. CLENCH (1942) placed the species in the synonymy of *C. regius cardinalis*; it is interesting to note that the locality cited by HWASS for *C. cardinalis* was 'Indian Ocean', followed by 'Santo Domingo' and 'Martinique'. COTTON (1945), however, synonymized *C. roseus* Lamarck with *C. granulatus* L. to which it bears hardly any resemblance. It is not known whether CLENCH compared actual specimens of *C. roseus* and *C. regius cardinalis*, but in his paper he states quite clearly that: 'I saw but a few specimens, and only one live shell (*C. regius cardinalis*)'.

Since CLENCH and COTTON placed *C. roseus* Lamarck in the synonymy of two totally different species, and an actual comparison of shells was not possible at the time because of their rarity, it is only to be presumed that *C. roseus* Lamarck disappeared in the synonymy of two West Atlantic species solely on the basis of LAMARCK's erroneous locality indications. Old locality records have often been found to be unreliable and such Indo-West Pacific species as *C. achatinus* Gmelin, *C. ammiralis* L., *C. catus* Hwass in Bruguière and *C. rattus* Hwass in Bruguière were all recorded from the 'American Ocean' by their authors. There can be little doubt that *C. roseus* of LAMARCK and subsequent authors is conspecific with *C. imperator* (Woolacott). Descriptions and illustrations are to be found, under the name *C. roseus*, in all major works on *Conus* [see synonymy]. REEVE (1843) gives a good description of the species mentioning the transverse grooves, indistinct ornamentation of reddish-brown dots, pale central band, strong coronations with interspaces stained reddish-brown, and a livid brown base. His illustration is of a somewhat pale beach specimen.

Conus roseus Lamarck is, however, a junior homonym of *C. roseus* Fischer, 1807 (= *C. granulatus* L.) and so is not available. But although *C. roseus* Lamarck is pre-occupied, *C. imperator* (Woolacott) cannot be retained in nomenclature as the species was validly established by LINK (1807: 106) as *Conus parvulus* (locality unknown), as stated by TOMLIN (1937: 287). LINK's citation of MARTINI (1773: pl. 63, fig. 707) is the same illustration as that cited by LAMARCK whose *C. roseus* is, accordingly, an absolute synonym of *C. parvulus* Link.

SYNONYMY

Conus parvulus Link, 1807

(Pl. 28, figs. 1-2)

- 1798 *Tableau Encyclopédique et Méthodique*: pl. 322, fig. 7.
- 1807 *Conus parvulus* Link. *Beschr. Nat.-Samml. Univ. Rostock* (Abth. 3): 106. [non *Conus parvulus* Martin, 1879].
- 1810 *Conus roseus* Lamarck. *Annls Mus. Hist. nat., Paris* **15**: 37. [non *Conus roseus* Fischer, 1807, nec *C. aulicus* var. *roseus* Sowerby, 1834, nec *C. roseus* Kiener, 1845 (pl. 107, fig. 4).]
- 1817 *Conus roseus* Lamarck. DILLWYN, *Descr. cat. recent shells* **1**: 404.
- 1822 *Conus roseus* Lamarck. LAMARCK, *Hist. nat. anim. sans Vert.* **7**: 458.
- 1828 *Conus roseus* Lamarck. WOOD, *Index testaceologicus*. 2nd edition: pl. 15, fig. 89.
- 1843 *Conus roseus* Lamarck. REEVE, *Conch. Icon.* **1** (*Conus*): pl. 33, sp. 186.
- 1845* *Conus roseus* Lamarck. KIENER, *Spec. gén. icon. Coq. viv.* **2**: 22, pl. 9, fig. 3. [non *Conus roseus* Kiener, 1845 (tom. cit.: pl. 107, fig. 4).]

* KIENER's specific names not only appear in the text which is variously dated [1846-50 for vol. **2** (*Conus*). See SHERBORN & WOODWARD, 1901. *Proc. malac. Soc. Lond.* **4**: 216-19], but also on the plates which date from 1845. Thus 1845 is the earliest indication for KIENER's species of *Conus*, as specific names are available if published in connexion with an illustration [ICZN Article 16(a) (vii)].

- 1857 *Conus mus* [partim]. SOWERBY, *Thes. Conch.* 3: 8, pl. 5, fig. 94. [non *Conus mus* Hwass in Bruguière, 1792.]
- 1884 *Conus mus* var. *roseus* Lamarck. TRYON, *Man. Conch.* 6: 20, pl. 5, fig. 73.
- 1913 *Conus roseus* Lamarck. SCHEPMAN, *Prosobr. Siboga exped.* (5): 380.
- 1937 *Conus roseus* Lamarck. DAUTZENBERG, *Mém. Mus. r. Hist. nat. Belg.* 2 (18): 217, 218, pl. 3, figs. 3, 4. [Dutch Indies.]
- 1942 [non] *Conus roseus* Lamarck. CLENCH, *Johnsonia* 1 (6): 5. [In synonymy of *Conus regius cardinalis* Hwass in Bruguière, 1792.]
- 1945 [non] *Conus roseus* Lamarck. COTTON, *Rec. S. Aust. Mus.* 8 (2): 269. [In synonymy of *Conus granulatus* L., 1758.]
- 1956 *Virroconus imperator* Woolacott. *Proc. R. zool. Soc. N.S.W.* 1954-55 [*The Mar. Zool.* 1 (4)]: 72, 73, fig. 3.
- 1959 *Conus roseus* Lamarck. WEBB, *Handb. for shell-collectors*. 14th edition: 31, pl. 14, fig. 3. [WEBB's locality 'Persian Gulf' requires confirmation.]
- 1964 *Conus (Virgiconus) imperator* Walcott [sic]. SHIKAMA, *Selec. shells world* 2: 124, pl. 68, fig. 3.

ACKNOWLEDGMENT

I would like to express my thanks to Dr R. WRIGHT BARKER for kindly supplying information. He has compared specimens of *C. imperator* from Australia with shells of *C. roseus* Lamarck in the British Museum (Natural History), and found them to agree in every particular.

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- WOOLACOTT, L., 1956. Notes on Australian shells, No. 1. *Proc. R. zool. Soc. N.S.W.* 1954-55 [*The Mar. Zool.* 1 (4)]: 72-75, fig. 3.

EXPLANATION OF PLATE 28

- Figures 1, 2. *Conus parvulus* Link. Great Barrier Reef, Queensland, Australia. Height 35.6mm.; maximum width 19.8mm.; height of spire 5.1mm.; apical angle 110°.

A NOTE ON *CONUS SOWERBYI* REEVE, 1849

By WALTER O. CERNOHORSKY

Vatukoula, Fiji Islands

(Read before the Society, 10 April 1965)

The name *Conus sowerbyi* Reeve, 1849, although a rejected homonym, is being frequently used in literature for a species of *Conus* originally established as *Conus bicolor* Sowerby, 1833 (? August, 1833: *Conchological Illustrations* pt. 37, fig. 56). [Parts 36 and 37 of the *Conchological Illustrations* ('small lists') are not dated, but may have appeared during August 1833 since part 35 (*Bulinus*) is dated 19 July 1833.] SOWERBY's *C. bicolor* of part 37 of the *Conchological Illustrations* is a primary homonym of *C. bicolor* Sowerby, 1833 (10 May 1833: op. cit. pt. 28, fig. 18) and *C. bicolor* Sowerby, 1833 (29 March 1833: op. cit. pt. 24, fig. 2).

In the 'large list' of the *Conchological Illustrations* SOWERBY (1833) substituted *C. sinensis* for the *C. bicolor* of part 37; unfortunately this substitute name is homonymous with *C. sinensis* Gmelin, 1791. REEVE described and figured the species as *C. sinensis* Sowerby in 1843 but later, in 1849, changed the name to *C. sowerbii* Reeve*, misspelling it in the process. *Conus sowerbii* Reeve, 1849 is, however, a homonym of *C. sowerbei* Nyst, 1836 and *C. sowerbyi* Bronn, 1848 [ICZN Article 58 (2)]. The next available synonym to replace *C. sowerbii* Reeve is *C. praecellens* A. Adams, 1854, the type of which is in the British Museum (Natural History) and represents the same species (Dr A. KOHN, *in litt.*). The chronological synonymy, as far as could be ascertained, is as follows.

* REEVE latinized his patronymics mostly by appending *-ii* to the entire name, e.g. *C. dillwynii*, *C. broderipii*, *C. stainforthii*, *C. boivinii*, *C. cumingii* and a host of others. In a few instances, however, he appended only *-i* to the entire name, e.g. *C. kieneri*, *C. vautieri*. REEVE was a good friend of SOWERBY's and knew how he spelt his name, so it is probable that he intended to spell the present species *C. sowerbyii*. It is rather obvious that in this case there was a *lapsus calami* or printer's error as he always spelt with a 'y' those species in other genera which he named in SOWERBY's honour.

Conus praecellens A. Adams, 1854

(Pl. 28, figs. 3-4)

- 1833 *Conus bicolor* Sowerby. *Conchological Illustrations* ('small list') part 37, fig. 56. [non Sowerby, 1833 (op. cit. pt. 24, fig. 2) nec Sowerby, 1833 (op. cit. pt. 28, fig. 18).]
- 1833 *Conus sinensis* Sowerby. *Conchological Illustrations* ('large list') part 37, fig. 56. [nomen novum pro *C. bicolor* Sowerby, 1833 (part 37) non Sowerby, 1833 (part 24) nec Sowerby, 1833 (part 28); non *C. sinensis* Gmelin, 1791.]
- 1843 *Conus sinensis* Sowerby. REEVE, *Conchologia Iconica* 1 (*Conus*): pl. 15, fig. 77a.
- 1849 *Conus sowerbii* Reeve. *Conchologia Iconica* (*Conus* emendations): 2. [nomen novum pro *C. sinensis* Sowerby, 1833 non Gmelin, 1791; non *C. sowerbei* Nyst, 1836 nec *C. sowerbyi* Bronn, 1848.]
- 1854 *Conus praecellens* A. Adams. *Proc. zool. Soc. Lond.* (21): 119.
- 1857 *Conus sowerbyi* Sowerby. *Thesaurus Conchyliorum* 3: 12. [nomen correctum pro *C. sowerbii* Reeve, 1849; non *C. sowerbyi* Bronn, 1848.]
- 1870 *Conus sowerbyi* var. *subaequalis* Sowerby. *Proc. zool. Soc. Lond.* for 1870: 257, pl. 22, fig. 5.
- 1931 *Conospira sinensis kueneni* Koperberg. *Jaarb. Mijnw. Ned.-Oost-Indie* 50: 59. [non *C. acutangulus kueneni* Koperberg, 1931 (tom. cit.: 58).]
- 1961 ? *Conasprella gratacap* (Pilsbry). HABE, *Coloured illustrations of the shells of Japan* 2: 74, pl. 36, fig. 14. [non *Conus gratacap* Pilsbry, 1904 (*Proc. Acad. nat. Sci. Philad.* 56: 7, pl. 1, figs. 10, 10a).]

Conus praecellens A. Adams is similar in form and colour-pattern to *C. acutangulus* Lamarck, 1810, but is a non-coronate species with small nodules confined to the early whorls, more pronounced spiral striae and weaker protraxially-curved axial riblets upon the whorls. The height of the spire varies from 36-46% of the total height. The type-locality is China (SOWERBY, 1833 and A. ADAMS, 1853). REEVE recorded *C. sowerbyi* as having been collected by HINDS in the 'Feejee Islands', but the species does not occur there. The distributional centre appears to be the Malaysian region, and specimens have been collected off Sumatra and the Philippine Islands (leg. Dr A. KOHN, 1964).

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EXPLANATION OF PLATE 28

- Figures 3-4. *Conus praecellens* A. Adams. Height 25.0mm., maximum diameter 11.0mm., height of spire 9.1mm., apical angle 60°. Dredged in 10 fathoms off Zamboanga, Sulu Sea, Philippine Islands.
- Figures 5-6. *Conus acutangulus* Lamarck. Height 23.3mm., maximum diameter 10.9mm., height of spire 7.0mm., apical angle 65°. Dredged in 4 fathoms off Akuilau Island, Fiji Islands.

THE CORRECT NAME FOR AN AFRICAN *BULINUS*

By B. VERDCOURT

Spring Cottage, Kimbers Lane, Maidenhead, Berkshire

(Read before the Society, 12 December 1964)

Bulinus nasutus (von Martens) has been the name in use for a common East African freshwater snail frequently concerned with the transmission of bilharziasis. *B. praeclarus* (Bourguignat) has been accepted as a synonym of this. Both names were first published in 1879. BOURGUIGNAT's publication is noticed in the *Naturae Novitates* of June 1879, while the *Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin* for the session of 15 July 1879, containing VON MARTENS's paper, would have been published subsequent to the latter date. Thus BOURGUIGNAT's name has priority. The synonymy is as follows:

Bulinus praeclarus (Bourguignat, 1879)

SUBSPECIES *praeclarus* s.s.

Physopsis praeclara Bourguignat, 1879 [ante June]: 14.

Physopsis nasuta von Martens, 1879 [post July]: 102.

Bulinus (*Physopsis*) *nasutus* (Martens). MAND AHL-BARTH, 1957: 14.

RANGE: Coastal areas of East Africa and some inland localities.

SUBSPECIES *productus* Mandahl-Barth

Bulinus nasutus productus Mandahl-Barth, 1960: 568.

RANGE: Around Lake Victoria. MAND AHL-BARTH's record from Usagara is geographically unlikely.

I am indebted to the late A. C. TOWNSEND of the General Library, British Museum (Natural History) for the dates of the publications mentioned above.

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MOLLUSCA FROM THE DAHLAK ARCHIPELAGO, RED SEA

By H. E. J. BIGGS

48 Park Road, Bromley, Kent

(Read before the Society, 14 November 1964)

The Mollusca collected by the University of Warsaw Expedition to the Red Sea in 1960 were entrusted to me for examination and report. The larger species were mostly dead shells, some very worn, of species which have already been reported from the Red Sea, and are not noted here. There was, however, a collection made in February 1960 of small and very small species from coral sand and gravel on the shore of Entedebir I. in the Dahlak Archipelago. This archipelago lies off the coast of Eritrea and Entedebir I. is about one mile square, lying about $15^{\circ} 43' \text{ N.}$ by $39^{\circ} 54' \text{ E.}$ The total weight of the sample remaining when most of the heavier shells had been removed was 56 gm. By counting the numbers of shells in small weighed subsamples it was estimated that the total number of shells in the collection was at least 13,000. To the best of my knowledge, little or no collecting has been done in this group of islands since the 'Pola' Expedition of 1895-96 and 1897-98 (STURANY, 1901, 1903): these additions to a little-known fauna are, therefore, very welcome.

LIST OF SPECIES

AMPHINEURA

Acanthopleura haddoni Winckworth. A few odd valves.

GASTROPODA

Rissoina sismondiana (Issel). Fairly common; the species also occurs in shell sand from Dongonab Bay, a little further north in the Red Sea. It also occurs in the Chagos Archipelago, Indian Ocean.

Rissoina (*Phosinella*) *seguenziana* Issel. Very common; also occurs in the Chagos Archipelago and is probably conspecific with some species described from Australia.

Heliacus variegatus (Gmelin). Two juveniles only.

Planaxis sulcatus (Born). Fairly common as juveniles; occurs northward and has penetrated the Suez Canal as far as Lake Timsah, where I have found it to be common.

Pirenella spp. The vast bulk of the sample examined consisted of juvenile and very worn examples of *Pirenella* and *Cerithium*. I have made no attempt to determine these further as that would have demanded an unwarranted expenditure of time.

***Cerithidea dahlakensis* n. sp. [Fig. 1]**

Shell small (H. 3.7mm., B. 2.0mm.), creamy white with brown stripes. Apex eroded in almost every case. Whorls about $5\frac{1}{2}$, increasing gradually and quite regularly, crossed by longitudinal varices of which there are ten on the body whorl and six on the penultimate. These tend to be broken up into gemmulations by latitudinal striations. The varices are cream coloured, the inter-varices reddish-brown. Suture moderately deep. Mouth pyriform, somewhat oblique, about 1.0mm. high by 0.75mm. broad; lip sharp, but thickened on the columella side and reflected slightly over it; siphonal canal shallow, somewhat narrow and oblique.

TYPE LOCALITY: Entedebir I., Dahlak Archipelago, Red Sea.

TYPES: Holotype in the Museum of the Institute of Zoology, University of Warsaw, Poland. Paratypes in the British Museum (Natural History); Senckenberg Museum, Frankfurt-am-Main [SMF 176183/5]; Muséum Nationale d'Histoire Naturelle, Paris; Academy of Natural Sciences of Philadelphia; BIGGS collection.

This is one of the commonest of the species in the sand—there must have been several hundred specimens. One of the paratypes measures 5mm. in height and 2mm. in breadth, but this is exceptional. A few of the paratypes are without the colour in the interstices.



Fig. 1. *Cerithidea dahlakensis* n. sp. Holotype. Height 3.7mm., maximum diameter 2.0mm. Institute of Zoology, University of Warsaw, Poland. Type locality: Entedebir I., Dahlak Archipelago, Red Sea.

Cerithium spp. See remarks above under *Pirenella*.

Triphora acicula (Issel). Only a small number of examples found.

Scala caneophora Melvill. One specimen.

Scala ?gloriola Melvill and Standen. Four examples and two juveniles found of a species of *Scala* which approximates to this species.

Scala melior Melvill and Standen. A few specimens found.

Scala spp. There were several other species of *Scala* in the sand but only two or three examples of each, so they must be considered rare.

Capulus sp. Nine examples of a species of this genus.

Pyrene atrata (Gould). Rare in the sand, only three examples being found. I consider *P. comistea* Melvill to be a synonym of this species.

Nassarius fissilabris (A. Adams). Rare, only six examples found.

Nassarius spp. There were at least four other small and very small species of this genus in the sand, some specimens being obviously juvenile. I feel it is better to leave these unnamed for the present.

Cythara capillacea (Reeve). Rare, five examples found.

Turbonilla spp. A few examples of several species.

Daphnella sp. Not common; it may be *D. amphitrites* Melvill and Standen.

Retusa truncatula (Bruguière). Three examples.

Cylichna spp. At least two species present.

Pedipes afer (Gmelin). Fairly common.

Laemodonta bicolor (Pfeiffer). A few dead shells present, which have lost all trace of the dark band. This species ranges south and east as far as Australia. It is not generally realized that many of the species from the Erythro-Farsian subregion are common to the whole Indo-Pacific region but in populations of such species from the Red Sea the size of the individual specimens may be reduced. I place these specimens in the present species on grounds of size, shape, dentition, etc., although they may later be considered to be a new subspecies.

Laemodonta striata (Philippi). Not common.

Allochroa bonni (Philippi) [= *conica* Pease]. Fairly common; apparently not previously recorded from the Red Sea.

Pupoides coenopictus (Hutton). This was the only species of land mollusc to be found in the shell sand. There were three specimens, probably of the subspecies *sennaricus* L. Pfeiffer. It is a very common species further north in the Sudan.

PELECYPODA

Brachidontes variabilis (Krauss). Juvenile valves fairly common.

Cardita variegata Bruguière. Juvenile valves fairly common.

Diplodonta rotundata (Montagu). Rare.

Diplodonta subrotundata Issel. Very rare; only two valves, and one of those damaged, were found. The species was described by ISSEL (1869: 253) from a single valve in the Turin Museum which was from one of the raised beaches common on the Red Sea coast; on his plate it is referred to as a fossil species. It is either a very rare species or else it has not been recognized.

Trachycardium maculosum (Wood). A few valves from Dahlak Bank collected in February 1960.

Hemicardia (*Hemicardia*) *nivale* (Reeve). Juvenile valves fairly common.

Gafrarium pectinatum (L.). A few juvenile valves.

Timoclea (Glycydonta) marica (L.). One example found, rather small and possibly a northern and western form of this species which is widely distributed in the Indo-Pacific region. STURANY (1901) has stated that ISSEL's *Chione römeriana* was founded on juveniles of this species; the wide variety in *marica* would account for this error besides the fact that Indo-Pacific species do tend to be smaller, not only in the Red Sea but also to some extent in the Persian Gulf.

Tellina (Moerella) pygmaea Lovén. Rare.

Tellina (Quadrans) palatum Iredale. Three valves only found.

Arcopagia (Pinguitellina) robusta (Hanley). Very many valves of a small species of *Arcopagia* were found in the sand. I refer them to this species although they are rather small when compared with others from Seychelles and India, but in view of what I have said above I think there is no objection to this.

Corbula acutangula Issel. One valve only found.

I have recently examined a number of similar shells from the Trucial Oman coast of the Persian Gulf. These also tended to be smaller than normal and had the same general facies as the Dahlak specimens. If this is a general trend, it may account for the multiplicity of species described under new names from the enclosed waters of the Erythro-Farsian subregion which are closely related to Indo-Pacific species. Many of the shells in the Dahlak sample are worn and somewhat difficult to determine and it is disappointing that so many species in the above list have to stand with a query against their names. Quite a number of others are still unnamed, but to have delayed publishing till all the collection was named would have meant withholding the information unjustifiably. Small and minute Mollusca with exact locality given are not often included in reports of collections from the Red Sea, and it seems to me that there is some point in doing so now even if the list is incomplete. One great value of a random collection such as this is that one has some idea of which species are abundant and which rare in a small area. As stated above, the vast bulk of the sample examined consisted of juvenile and very worn examples of species of *Cerithium* and *Pirenella*.

There is more mud and silt in the substrate at Dahlak than further north in the Red Sea. Mr WILLIAM REED of Port Sudan informs me that, with regard to the large trochid *Trochus dentatus* Forsskål*, the shells from Dahlak are 'lighter with small nodules and of poor quality, while the local [i.e. Dongonab Bay] race of trochus has large nodules and is heavy'. It seems that the ecological conditions of the southern area of the Red Sea, on the African side at least, are different from those further north and need a lot more investigation by further future expeditions.

* This is apparently the correct spelling of FORSSKÅL's name. (See LEMCHE, 1965. *Bull. zool. Nom.* 22: 9.)—Ed.

ACKNOWLEDGMENTS

I am grateful to Mr TOMASZ UMINSKI for the opportunity to examine the shells collected by the University of Warsaw Expedition to the Red Sea, and to Prof. Dr ZDZISLAW RAABE, head of the Zoological Institute of that university, for permission to publish this report on some of the material. I am also grateful to Mr W. REED for a sample of the shell sand from Dongonab Bay for comparison with the Dahlak sample.

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CONUS GLORIAMARIS CHEMNITZ IN NEW GUINEA, 1964

Since the discovery of the three specimens of *Conus gloriamaris* Chemnitz in 1963 (*J. Conch.* 25: 251-52, pl. 17), nine more shells have been reported from New Guinea. Although some of these finds have already been recorded (*J. Conch.* 25: 267), the information is repeated here for the sake of completeness.

1. Sabah Plantation, Bougainville; height *c.* 100mm. Found in March by REX BLOW; purchased for the Academy of Natural Sciences of Philadelphia for \$220.
2. Matupi Island, Rabaul. Found in April; children smashed it with a hammer.
3. Matupi Island; height *c.* 75mm. Found in June by a native, MATIVA; purchased by Prof. R. TUCKER ABBOTT for \$20.
4. Kurakakaul, Rabaul; height 120mm. Found in June by native, IVEVE; purchased by BERT SPEERS for £10.
5. Sio, north-east New Guinea; height 115mm. Found by JOHN CROWHURST, and sent to Prof. ABBOTT.
6. Matupi Island; height 47mm. Found in August.
7. Matupi Island; height 72mm. Found in September by native, TOWENA.
8. Matupi Island; height 95mm. Found in September by native, ALICK.
9. Sabah Plantation; height 125mm.

The Matupi shells are from an area immediately adjacent to an active volcano; the area has numerous hot water vents and patches of warm, cloudy water.

M. R. HAYES

(Read before the Society, 12 December 1964)

J. Conch. 25: 341. (1965)

NOTE ON THE MOLLUSCA OF THE GRANGE-OVER-SANDS DISTRICT, LANCASHIRE

By J. O'N. MILLOTT

23 Sandy Lane, Boughton, Chester

(Read before the Society, 14 November 1964)

THURGOOD and THURGOOD (1949) recorded the occurrence of nineteen species of Mollusca in Eggerslack Wood, Grange-over-Sands, and mentioned that neither *Balea* nor any species of *Vertigo* were found on the occasion of their visit. These and several other snails that would have been expected to be present in this wood, following the work of STANDEN (1898), JACKSON and MOORE (1904), JACKSON (1906) and BEESTON (1908, 1909), were not seen.

During a short holiday in the district in June 1964 I paid several visits to the wood and, whilst I would no longer describe it as the conchological paradise it formerly appears to have been, I was able to add a few species to the THURGOODS' list as still being present. These only became evident after a good deal of close search and the careful examination of a sackful of dead leaves gathered in various parts of the wood. These additional species are listed below.

Vertigo pygmaea (Draparnaud): one specimen (dead) among leaves.

Acanthinula aculeata (Müller): one dead shell.

Acanthinula lamellata (Jeffreys): one or two living specimens among beech leaves.

Marpessa laminata (Montagu): several alive on the trunks of beech trees.

Balea perversa (L.): one juvenile specimen on a wall near the wood.

Monacha granulata (Alder): one or two living specimens.

Retinella radiatula (Alder): one living specimen on dead wood.

Despite careful search no other species of *Vertigo* nor *Acicula fusca* (Montagu) were found. Like the THURGOODS, I saw nothing of *Helicella caperata* (Montagu) on the Lindale Road cliffs, nor of *Oxychilus draparnaldi* (Beck) recorded by JACKSON (1906). It is worth mentioning, however, that whilst searching in the vicinity of Meathop Fell for *Succinea oblonga* Draparnaud (which still occurs there very sparingly) several dead shells of *Potamopyrgus jenkinsi* (Smith) were found in muddy ground near the small stream flowing through the meadow opposite the Fell. This species is not mentioned by JACKSON or BEESTON, and so has presumably arrived since 1909. A further feature of interest concerning the Grange district, which does not appear to have been previously mentioned, is the number of *Arion ater* var. *alba* (L.) which occur there.

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MARINE RECORDER'S REPORT: A CORRECTION

[An unfortunate error occurred in the Marine Recorder's Report (*J. Conch.* **25**: 310) in connexion with my note on the genus *Ranella*. I questioned the statement by DELL and DANCE that the genus *Ranella* dates from LAMARCK, 1816, and proposed that it be dated from 1797 with BRUGUIÈRE as author. This proposal was entirely inaccurate and I apologize for any misunderstandings which it may have caused. I am most grateful to Mr W. O. CERNOHORSKY for promptly drawing my attention to the error, and for kindly supplying the following information.

D. HEPPELL]

Plates 391–488 of the *Tableau Encyclopédique et Méthodique* appeared in the vingt-troisième partie; the fly-leaf of this particular livraison [livraison 84] is dated 1816, and the author is cited as M. LAMARCK. This livraison is accompanied by sixteen pages of text entitled: 'Liste des objets représentés dans les planches de cette livraison'. The genus *Ranella* is listed on p. 4, and delineated on plates 412–14. The species *Ranella gigantea* Lamarck appears on pl. 413, fig. 1. For confirmation of these data, and also that the copy in my possession is complete, please refer to SHERBORN and WOODWARD, 1906: 'On the dates of publication of the Natural History portions of the Encyclopédie [sic] méthodique'. *Ann. Mag. nat. Hist.* (7) **17**: 577–82. The date of publication of LAMARCK's plates 391–488 appears on page 581. When these plates appeared BRUGUIÈRE had already been dead for eighteen years. The plates of *Ranella* (pls. 412–14) were engraved by J. DROUET in 1815, which information is given in fine engraving at the bottom of the plates. Thus there can be no dispute as to the correct interpretation of the date of publication of these plates, and Messrs DELL and DANCE are, therefore, entirely correct in dating *Ranella* from LAMARCK, 1816. The type-species by subsequent designation (CHILDREN, 1823) is *Ranella gigantea*.

WALTER O. CERNOHORSKY

A CURIOUS MONSTROSITY OF *HELIX ASPERSA* MÜLLER

By M. R. BLOCK

12 Willow Road, Tadley, Basingstoke, Hampshire

(Read before the Society, 10 April 1965)

Among various snails received from Lija, Malta, in January 1965 was the curious pair of shells figured. A small *Helix aspersa* Müller has attached itself to the body whorl of a larger individual, opposite the mouth and in direct line with the suture. Here it must have died and the larger individual, being unable to rid itself of the encumbrance, has grown around and partly enclosed it. The smaller shell is now fused with the larger one, standing out sideways like an extra spire, and projecting into the cavity of the body whorl as a small bulge, smoothed over with callus. The suture of the larger shell passes smoothly round the obstruction almost to the other side, where growth has ceased with the development of the reflected lip indicating maturity. There is a slight distortion opposite the intruding shell, but otherwise both are quite normal. Traces of epiphragm in the juvenile indicate that it was hibernating on the other.

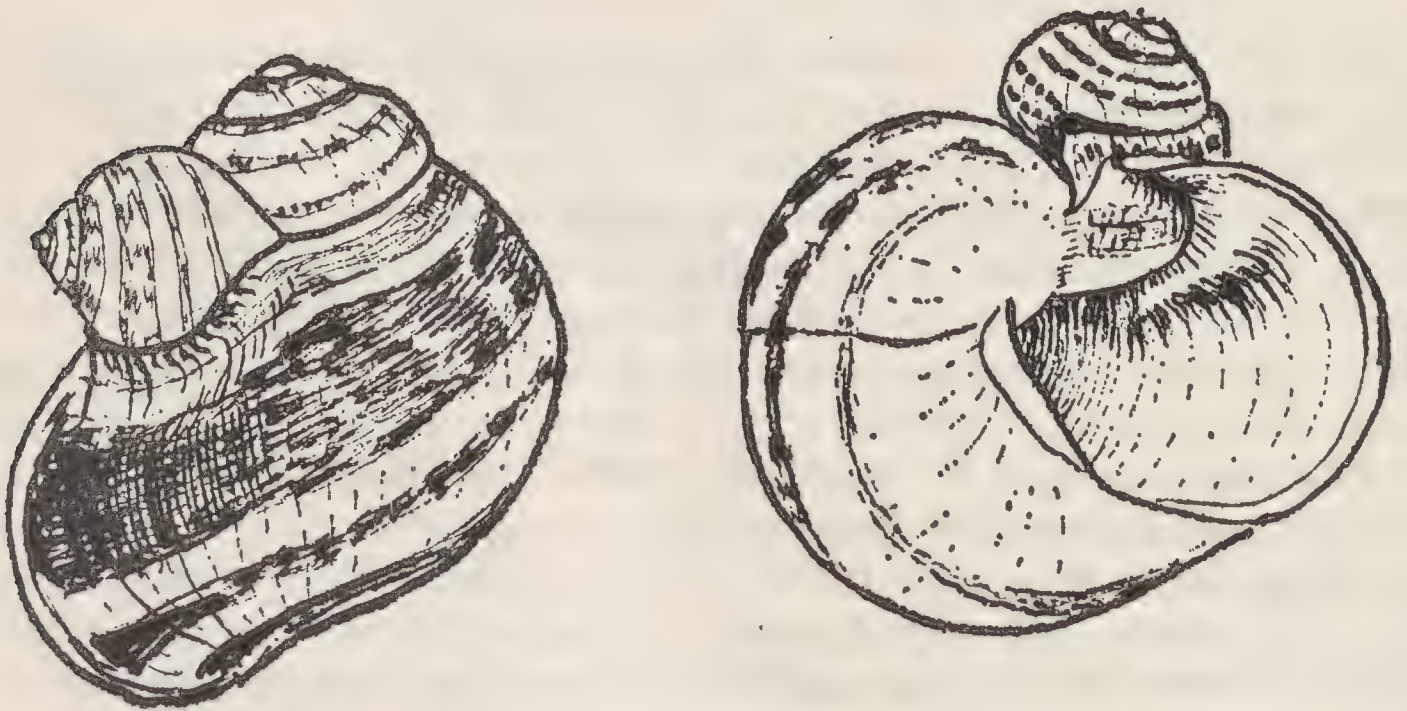


Fig. 1. *Helix aspersa* Müller, monstrosity. $\times 1\frac{1}{2}$. Lija, Malta. 20 January 1965

The snail was found alive and apparently healthy in company with *Cantareus apertus* (Born), *Oxychilus draparnaldi* (Beck) and others of its own species under rocks in a weedy garden. It has been killed and the shell deposited in the author's collection.

ARION LUSITANICUS MABILLE IN DEVON

By A. E. ELLIS

88 Boundary Road, Carshalton, Surrey

(Read before the Society, 12 December 1964)

During the first week of October 1964 I collected some slugs, at the time thought to be rather undersized *Arion rufus* (L.), on grassy verges and in allotment gardens at the south end of Clapperbrook Lane, Alphington, two miles south of Exeter, South Devon [National Grid reference SX 919900]. The slugs were reddish or yellowish with no trace of lateral bands and were virtually indistinguishable from some colour forms of *Arion ater* (L.) and *A. rufus*, such as those of which sketches of the distal genitalia are shown in figures 5 and 9. When these slugs were subsequently dissected it came as a surprise to discover that they were nevertheless all *Arion lusitanicus* Mabille. The anatomy of the genitalia is essentially similar to that of Cornish specimens (ELLIS, 1964), except that the free oviduct tends to make a less obtuse angle, in some cases practically a right angle, with its distal dilated portion ('vagin' of MOQUIN-TANDON) containing the 'ligula', in this respect approaching *Arion subfuscus* (Draparnaud). Though generally less pronounced than in Cornish *A. lusitanicus*, the bulge on the duct of the spermatheca is a characteristic feature. The only illustration known to me which shows this enlargement is that of QUICK (1952: fig. 1; reproduced in 1960: fig. 5A). POLLONERA's figure, copied by TAYLOR (1905: fig. 216), which in most respects corresponds closely to the Devon examples, does not indicate this character. This swelling is not developed in young individuals (QUICK, 1952: fig. 12; 1960: fig. 6c). In young *A. ater*, however, as shown by QUICK (1947: 251 and fig. 6), the distal end of the spermatheca duct is slightly dilated [fig. 7]. Apart from this, the illustration of the genitalia of '*Arion rufus*' in MOQUIN-TANDON (1855: pl. 1, fig. 12) could well represent *A. lusitanicus*, which inhabits the south of France; as pointed out by QUICK (1960: 146), it is certainly not *Arion rufus*. When MOQUIN-TANDON began his celebrated work he was living at Toulouse. As in Cornish examples, the epiphallus and terminal portion of the oviduct are not pigmented in the *A. lusitanicus* from Devon, thus differing from the illustrations given by both POLLONERA and QUICK.

It is possible that some of the records cited by TAYLOR (1905: 187) for *Arion ater* var. *fasciata* Van den Broeck are referable to *A. lusitanicus*, while his coloured figure (1907: pl. 18, fig. 8) of a specimen from Tenby could well represent some of the Cornish *A. lusitanicus*. Indeed this slug is quite likely to turn up in Pembrokeshire, on the analogy of certain

local snails such as *Theba pisana*, *Hygromia subvirescens* and *Lauria anglica* which occur in Portugal and in the south-west of both England and Wales. Most of the localities cited for this banded variety are in Ireland: the Irish Arions call for reinvestigation, and it would be especially interesting to have confirmation of the occurrence of *A. lusitanicus* in Co. Cork, whence it was recorded by COLLINGE in 1893. Var. *subreticulata* Cockerell from Truro might also be referable to this species rather than to *A. ater*. It is suggested that this slug may be truly native in the south-west of Great Britain and in Ireland; although its recorded habitats in the British Isles have so far been cultivated places, Mrs S. M. TURK informs me that she has taken it in a wild habitat at Tremelling, near St Erth, Cornwall.

Dissections of the distal (anterior) parts of the genitalia of four specimens of *A. lusitanicus* from Devon are here figured, together with those of *A. ater* and *A. rufus* for comparison. In all my drawings the spermatheca has been displaced towards the animal's right side, because in its undisturbed position it is partly obscured by other structures; the vas deferens has been more or less unravelled. The determination of all the specimens here figured (except fig. 7) and all those in my 1964 paper has been confirmed by Dr H. E. QUICK, which of course confers upon them great extrinsic value: indeed, the publication of these authenticated drawings is the principal justification for presenting this communication. As it is not at all difficult to dissect these large Arions, it is hoped that more malacologists will interest themselves in their distribution. Records not based on examination of the critical characters of the genitalia are really valueless.

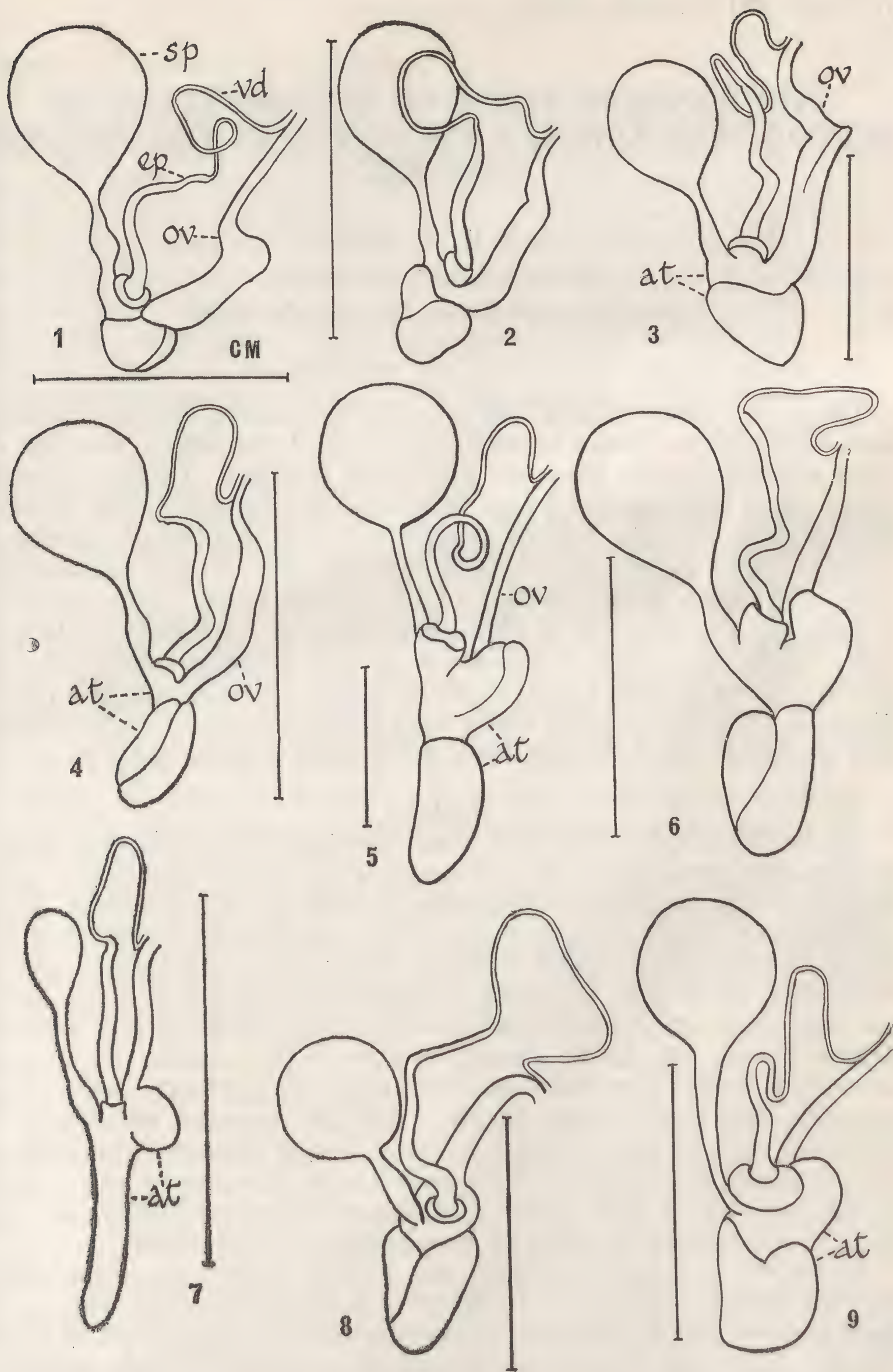
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EXPLANATION OF TEXT-FIGURES

Dissections of the distal genitalia of *Arion*.

- at* atrium or vestibule; *ep* epiphallus; *ov* oviduct; *sp* spermatheca; *vd* vas deferens.
 Figures 1-4. *Arion lusitanicus* Mabille. Alphington, Devon.
 Figure 5. *A. ater* (L.). Danbury, Essex. Mrs J. LLEWELLYN JONES.
 Figure 6. *A. ater*. Shoreham, Kent. Miss JUNE CHATFIELD.
 Figure 7. *A. ater* (immature). Mickleham, Surrey.
 Figure 8. *A. ater*. Zennor Head, Cornwall. E. G. ING.
 Figure 9. *A. rufus* (L.). Cheriton Bishop, Devon.



Dissections of the distal genitalia of *Arion*.

THE EASTERN LIMIT OF DISTRIBUTION OF *MONODONTA LINEATA* (DA COSTA) IN THE ENGLISH CHANNEL

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(Read before the Society, 14 November 1964)

ABSTRACT

The survey reported here indicates that the eastern limit of distribution of *Monodonta lineata* in Britain more nearly corresponds to that of other southern forms than was previously thought. Lack of suitable shores and a very restricted zone of vertical distribution appear to limit *Monodonta* in Dorset. Periods of extremely cold weather can eliminate or severely reduce populations living near the limit of their distribution, causing variation in the position of the eastern limit. Since the prolonged cold weather early in 1963, *Monodonta* has been found in Dorset only below West Cliff, Portland—a position sheltered from easterly winds. Young animals (1 cm. in diameter) were absent from this population in 1963. Remains of shells were difficult to find at Lyme Regis only six months after the presumed death of the population there.

HABITAT

LEWIS (1964) states that *Monodonta lineata* (da Costa) is most abundant on flat, semi-sheltered open coasts where there is much bare rock amongst thinly distributed *Chthamalus*, *Pelvetia* and *Fucus spiralis*. Top-shells require broken shores and even in considerable shelter they are scarce on steep slopes unless there are many cracks and ledges. LEWIS states that, for its size, *M. lineata* is remarkably tolerant of wave action and may occur on the flatter and broken upper regions of very exposed *Mytilus* shores even in the absence of most of the fucoids. *Monodonta* is stated to be less plentiful where the fucoid cover is heavy or the rocks muddy. Mrs S. M. TURK (*in litt.* 1964) has recorded *Monodonta* in Cornwall and the Isles of Scilly where *Littorina littorea* (L.) is absent, and associates its occurrence with considerable exposure to wave splash or the presence of rock pools. FRETTER and GRAHAM (1962) note the habit of *Monodonta* of sitting on bare rocks in full sunlight.

Monodonta is usually restricted to a narrow vertical zone just below HWNT with 50-60% exposure (FRETTER & GRAHAM, 1962). The upper limit appears to coincide most commonly with the upper limit of *Fucus spiralis*. The lower limit is usually midshore to LWNT in the summer, but in the winter it may be considerably lower owing to the detaching of the animals from the substrate at low temperatures or, possibly, to migration (CRISP, 1964: fig. 9).

DISTRIBUTION

GENERAL DISTRIBUTION IN BRITAIN

The distribution of *M. lineata* in Britain has been described by McMILLAN (1944). The species is recorded from the Channel Islands; the English Channel coast as far east as Golden Cap, Chideock, Dorset; along the Bristol Channel to Minehead; on the Welsh coast from Gower to Pembrokeshire, in suitable localities on the shores of Cardigan Bay to Pwllheli, and on the west and south-west shores of Anglesey; on the south and west coasts of Ireland as far north as Narin, Co. Donegal, with an isolated population 54 miles further north at Whitestrand Bay. The distribution on the east coast of Ireland is described as very patchy, with a northern limit at Benderg Bay, Co. Down. Her account shows a distribution very similar to that given in map form by LEWIS (1964).

PREVIOUS RECORDS OF EASTERN LIMIT

DA COSTA (1778) mentioned the coasts of Dorset and Hampshire, while PULTENEY (1799) stated: 'Not very uncommon on the Dorset coast'. CUNDALL (1887) did not record *Monodonta* at Lyme Regis. MANSEL-PLEYDELL (1899) gave Portland, Lulworth Cove and Kimmeridge Bay. GARDINER (1923) reported *Monodonta* as not present east of the Golden Cap, Chideock, as did McMILLAN (1944). SYKES (1945) added Charmouth and Studland to previously published records, the latter being from manuscript notes of A. W. ROWE, in the Dorset County Museum, who also reported 'Swanage' with a query. FRETTER and GRAHAM (1962) give Poole as the eastern limit but that is an approximation, their most easterly specimen being found at St Alban's Head (Dr V. FRETTER, *in litt.* 1964).

M. lineata was not recorded east of Lyme Regis by CRISP and SOUTHWARD (1958) in their survey of the distribution of intertidal organisms along the English Channel coast. They expressed doubt regarding the records of MANSEL-PLEYDELL, although other organisms of limited distribution were found as far east as the Isle of Wight.

DISTRIBUTION IN DORSET 1961-62

From 1961 onwards, a survey has been made of the distribution of *Monodonta* in Dorset. The small tidal range in Dorset results in narrow vertical zones of distribution on the shore. East of Portland, *Monodonta* appeared to be restricted to a very narrow vertical zone and proved difficult to find even where it was known to be present. The zone frequently consisted of many loose rocks, making searching laborious.

During 1961 and 1962 all Dorset shores except Chesil Bank, the east coast of Portland, Gad Cliff (between Lulworth Cove and Kimmeridge Bay), Swanage and Durlston Bays, and Poole Harbour were searched for *Monodonta*. Particular attention was paid to the *F. spiralis* and *F. vesiculosus* zones and the equivalent level where those algae were absent, but traverses of all shores were made at approximately hundred yard

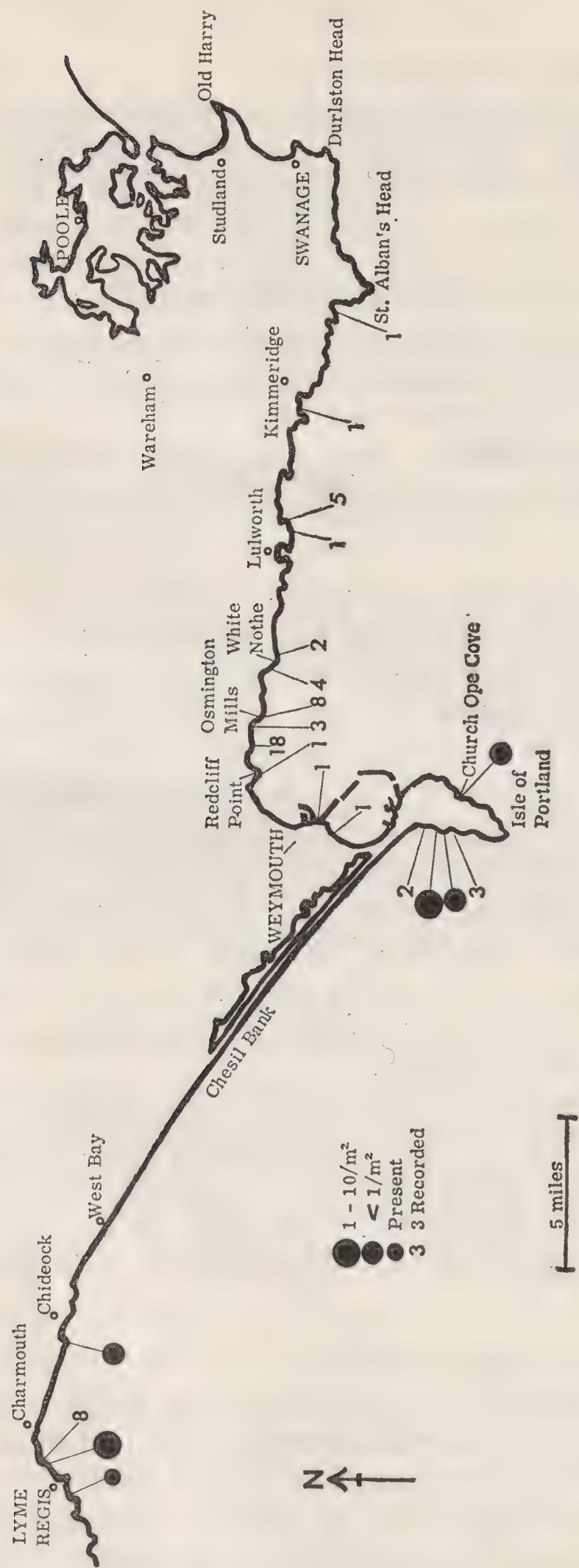


Fig. 1. Distribution of *Monodonta lineata* (da Costa) in Dorset, 1961-62.

intervals. Suitable shores were searched intensively: the solitary specimen recorded at Redcliff Point was found after a two hours' search of a twenty yard stretch of beach.

Figure 1 indicates the localities where *Monodonta* was found. The number of animals is indicated, but these are minimum population sizes. It may be significant that Osmington Mills, a shore visited regularly, has a relatively high figure. Live *Monodonta* were collected in 1961 at Church Ope Cove, on the east of Portland, by a sixth-form student. The author did not search there until 1963. All except one of the specimens found east of Weymouth had maximum shell diameters of 2cm. or more, and appeared old; at Lyme Regis, 2cm. was the maximum size; below West Cliff, Portland, sizes ranged from 1cm. to over 2cm. diameter.

The presence of *Monodonta* was associated with rock ledges or stable rocks in positions sheltered from severe wave action. The population on the west coast of Portland was protected by large blocks of rock low on the shore. The three most southerly specimens recorded from the west of Portland were small and were found high up behind large blocks of rock at the base of the cliff. The upper shore of most of the Dorset coast is affected by shingle and sand. Unexposed, stable upper shores suitable for *Monodonta* are infrequent but, of the apparently suitable localities searched, only Stair Hole, Lulworth Cove, and the shore above Kimmeridge Ledges appeared to have no *Monodonta*. The shore between Studland and Old Harry was sand scoured and did not appear suitable.

DISTRIBUTION IN DORSET 1963-64

Since the cold winter of 1962-63, *Monodonta* has not been found anywhere in Dorset except on the west coast of Portland. In August 1963 the population below West Cliff appeared to be considerably reduced, the animals occurring at less than 1/m². The total number present was estimated to be under 200. No specimens were found with a diameter less than 2cm. The earlier information for this population was recorded in the August of 1961.

In April 1962, *Monodonta* was common at Lyme Regis; in September 1963 no live animals were found. Although dead shells of *Gibbula umbilicalis* (da Costa), which was considerably affected in Dorset by the cold winter, were abundant, only two dead shells of *Monodonta* were found. One of these was a fragment, the other was undamaged and occupied by a small hermit crab *Eupagurus bernhardus* (L.). Three specimens of *Monodonta* found at Lyme Regis in April 1964 were remnants of a small population released in September 1963. Thorough searching in July 1964 yielded only two specimens, which were collected.

CRISP and SOUTHWARD (CRISP, 1964) recorded the disappearance of *Monodonta* from Lyme Regis, Seaton, Branscombe, Budleigh Salterton and east Exmouth and the reduction of the Torbay population. In the same paper MOYSE and NELSON-SMITH, and CRISP give maps to show the effect of the 1962-63 winter on the distribution of *Monodonta* in South and North Wales, and BOADEN, GOTTO, HARTNOLL and WILLIAMS record heavy mortality of the species at Killough, north-east Ireland.

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AN INTERSTADIAL HORIZON OF THE LAST GLACIATION AT HALLING, KENT

By J. P. T. BURCHELL

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(*Read before the Society, 17 October 1964*)

ABSTRACT

Two geological sections at Halling, Kent, are described and the molluscan fauna of the successive deposits is examined quantitatively. In the western section a Brickearth occurs between two Coombe Rock deposits. The Mollusca of the Brickearth indicate the interstadial nature of the deposit which, from its geological position, post-dates the temperate bed of the Last Interglacial Period which likewise occurs between two Coombe Rock deposits in the Ebbsfleet Channel sequence. The interstadial horizon represented at Halling is correlated with the Brørup Interstadial of the Last Glaciation. Overlying the Upper Coombe Rock is a complete series of deposits of Late-glacial age ranging from the earliest part of Zone I to the early part of Zone III of the Last (Weichselian) Glaciation.

INTRODUCTION

I was fortunate many years ago in being joined in my field work by the late A. G. DAVIS, in whose company fresh sections over a wide area of Kent were examined in detail and those sections with which I had been concerned before the 1939–45 war were re-examined. The collection of shells so obtained was presented to the British Museum (Natural History) in 1957 together with detailed lists of the various molluscan faunas. Several sites still remain undescribed, however, and this paper marks the beginning of the repair of this omission.

Fifteen years ago I investigated a temperate bed and its contents which belonged to the Last Interglacial Period and formed part of the infilling of the Ebbsfleet Channel at Northfleet, Kent (BURCHELL, 1957). This bed contained a temperate molluscan fauna together with artifacts of Micoquian age. Subsequently I examined a series of sections in the vicinity of the Grey Chalk Pit at Yew Tree Hill, Halling, Kent [National Grid reference: TQ 698648]; the deposits of two representative sections are described below. No other site in this country, so far as I know, provides a complete succession of deposits ranging from a Coombe Rock, resting upon solid Chalk and post-dating the temperate bed of the Ebbsfleet Channel, up to and including the earliest portion of Zone III of Late-glacial times.

WESTERN SECTION

The geological section, situated at the junction of the pit and the tramway cutting, has a surface level at 50 ft above O. D. and shows, in descending order, the following series of deposits.

THICKNESS	NO.	DEPOSIT
0' 9"	8	Surface soil.
2' 3"	7	White stoneless loam, Subaerial loam No. 3* (Lower Part).
0' 5"	6	Grey stoneless carbonaceous loam, Subaerial loam No. 2.
2' 9"	5	Fine, slightly ochreous loam.
6' 6"	4	Upper Coombe Rock.
8' 0"	3	Brickearth.
5' 6"	2	Lower Coombe Rock.
	1	Chalk.

All the above deposits are calcareous and owe their colour in direct ratio to the amount of chalk each contains. The level of the Chalk, which here is *c.* 25ft above O. D. level, falls progressively eastwards until it encounters the left bank of the Sunk Channel of the River Medway.

The Brickearth (deposit No. 3) between the two deposits of Coombe Rock is characterized by a molluscan fauna of interstadial facies containing land, marsh and freshwater species. The deposit is readily divisible into four parts, the middle two of which are by far the richest in their molluscan content. The Mollusca of the Brickearth are listed in Table 1, from which it will be clear that the Mollusca of part C reflect much wetter conditions than those obtaining in any other part of the deposit. Such wetter conditions are indicated by the marked prevalence of *Hygromia hispida*, *Succinea oblonga* var. *agonostoma*, *Columella columella* and *Limax* spp. The marked decrease of the Distribution Number of the uppermost part of the Brickearth foreshadows the return of glacial conditions, just as the very low Distribution Number of the lowermost part reflects the very cold conditions still obtaining immediately after the formation of the Lower Coombe Rock.

A recent paper by KERNEY (1963), in which among other sites he describes a neighbouring valley to that considered here, provides additional confirmation of the interstadial nature of the Brickearth fauna. He writes (p. 233): 'It is interesting to observe that the present distributions in Europe of *Hygromia hispida* and *Columella columella* seem scarcely to overlap, yet in zones II and III at Castle Hill these species occur abundantly together, and are similarly common in Late-glacial deposits at Nazeing in the Lea Valley'. It is generally appreciated that the climatic conditions obtaining during Zone II times represented interstadial conditions.

* All references in this paper to the numbered Subaerial loams relate to the sequence noted in BURCHELL (1933:83; 1936:552) and to be fully described at a later date.

Table 1. Mollusca of the Brickearth between Upper and Lower Coombe Rock

SPECIES	SUBDIVISIONS OF THE BRICKEARTH			
	A	B	C	D
<i>Lymnaea truncatula</i> (Müller)	—	—	1	—
<i>Succinea oblonga</i> var. <i>agonostoma</i> Küster	4	48	583	144
<i>Columella columella</i> (Benz)	—	3	114	10
<i>Pupilla muscorum</i> (L.)	6	103	869	47
<i>Vallonia costata</i> (Müller)	—	2	—	—
<i>Hygromia hispida</i> (L.)	1	31	727	14
<i>Discus rotundatus</i> (Müller)	—	—	1	—
<i>Arion</i> sp., indeterminate, small	rare	common	abundant	abundant
<i>Vitrina pellucida</i> (Müller)	—	1	1	—
<i>Limax</i> spp., indeterminate	—	5	177	3
Distribution Number	1	105	200	30

The Distribution Number represents the number of shells contained in 2 lb of matrix.

When one comes to examine the Late-glacial deposits overlying the Upper Coombe Rock in the western section one finds that the earliest members of the sequence are here missing and that the first deposit present in the series (No. 5) belongs to the earliest stage of Zone II. This is borne out not only by the number of species of molluscs present but also by the high Distribution Number of 75.

Table 2. Mollusca of Late-glacial deposits overlying Coombe Rock, western section

SPECIES	DEPOSIT	DEPOSIT	DEPOSIT
	No. 5	No. 6	No. 7
<i>Carychium tridentatum</i> (Risso)	—	—	1
<i>Cochlicopa lubrica</i> (Müller)	—	5	—
<i>Pupilla muscorum</i> (L.)	117	29	19
<i>Abida secale</i> (Draparnaud)	—	21	7
<i>Vallonia costata</i> (Müller)	87	39	6
<i>V. pulchella</i> (Müller)	13	2	—
<i>Cecilioides acicula</i> (Müller)	—	2	1
<i>Arianta arbustorum</i> (L.)	—	trace	—
<i>Helix nemoralis</i> L.	—	trace	1
<i>Hygromia hispida</i> (L.)	—	—	5
<i>Helicella geyeri</i> (Soós)	—	2	—
<i>H. striata</i> (Müller)	—	5	—
<i>Punctum pygmaeum</i> (Draparnaud)	—	—	6
<i>Arion</i> sp., indeterminate, small	scarce	common	rare
<i>Euconulus fulvus</i> (Müller)	—	1	—
<i>Retinella radiatula</i> (Alder)	1	3	—
<i>Vitrina pellucida</i> (Müller)	11	1	2
<i>Limax</i> sp., indeterminate	1	6	—
Distribution Number	75	55	10

Deposit No. 6 is a carbonaceous buried soil which should also be assigned to Zone II, since it is characterized by a specific molluscan fauna including *Helicella geyeri* and *H. striata*. That this particular horizon occupies a late stage in Zone II is suggested by the comparatively short list of molluscan species present and the fact that the Distribution Number of 55 falls far short of that which this deposit would normally yield, thus anticipating the recrudescence of the cold climatic conditions of Zone III which are indicated in deposit No. 7 by a molluscan content of but a few species and a Distribution Number of 10. The Mollusca of the Late-glacial deposits overlying the Upper Coombe Rock of the western section are listed in Table 2.

EASTERN SECTION

The earliest deposits of the Late-glacial sequence, which are missing from the western section, may be examined in a section situated between 200 and 300 yards eastwards along the cutting at a location on the further side of the footbridge. Here the surface level is 30 ft above O.D., whilst the top of the underlying Chalk has dipped sufficiently to be no longer seen in the face of the section. The deposits to be seen in this section are as follows.

THICKNESS	NO.	DEPOSIT
1' 0"	6	Surface soil.
3' 0"	5	White stoneless loam, Subaerial loam No. 3 (Lower Part).
0' 4"	4	Grey stoneless carbonaceous loam, Subaerial loam No. 2.
1' 0"	3	Fine ochreous loam.
4' 0"	{ 2b 2a }	Brown loam, Subaerial loam No. 1.
	1	Upper Coombe Rock.

All the above deposits are calcareous and owe their colour in direct ratio to the amount of chalk each contains. Deposit No. 2a interdigitates with the top of the Upper Coombe Rock and is the earliest member of the Late-glacial deposits. Although calcareous, it contains no shells, thus indicating that climatic conditions at that time were too severe for a molluscan fauna to be re-established. Corroborative evidence of this may be observed elsewhere in contemporaneous sections.

Re-introduction of the molluscan fauna began with the upper portion of the brown loam (deposit No. 2b) although climatic conditions were clearly still uncongenial, for the Distribution Number of this horizon is as low as 1; indeed conditions obtaining during the formation of deposit No. 3 cannot have been much more genial, as the Distribution Number of that horizon has risen only to 5, so that it can safely be said that deposits No. 2a, 2b and 3 are contemporary with Zone I. In deposit No. 4 not only are there twice as many species of Mollusca but the Distribution Number has risen to 40, so there would seem to be no doubt that this

horizon, characterized by the presence of *Helicella geyeri* and *H. striata*, should be assigned to the latter part of Zone II. From previous evidence deposit No. 5, Subaerial loam No. 3 (Lower Part), witnessed the commencement of Zone III, a period when climatic conditions had again deteriorated as is evidenced by the drop of the Distribution Number to 10. The Mollusca of the deposits of the eastern section are listed in Table 3.

Table 3. Mollusca of Late-glacial deposits overlying Coombe Rock, eastern section

SPECIES	DEPOSIT				
	No. 2a	No. 2b	No. 3	No. 4	No. 5
<i>Cochlicopa lubrica</i> (Müller)	—	—	—	22	7
<i>Pupilla muscorum</i> (L.)	—	6	30	79	27
<i>Abida secale</i> (Draparnaud)	—	—	—	9	20
<i>Vallonia costata</i> (Müller)	—	11	78	190	20
<i>V. excentrica</i> Sterki	—	1	18	15	4
<i>V. pulchella</i> (Müller)	—	—	4	15	4
<i>Ceciloides acicula</i> (Müller)	—	—	—	4	—
<i>Hygromia hispida</i> (L.)	—	—	—	—	2
<i>Helicella geyeri</i> (Soós)	—	—	—	2	—
<i>H. striata</i> (Müller)	—	—	3	30	8
<i>Punctum pygmaeum</i> (Draparnaud)	—	—	—	4	9
<i>Arion</i> sp., indeterminate, small	—	very rare	very rare	common	common
<i>Eucomulus fulvus</i> (Müller)	—	—	—	—	7
<i>Retinella radiatula</i> (Alder)	—	—	—	12	6
<i>Vitrina pellucida</i> (Müller)	—	4	1	1	—
<i>Limax</i> sp., indeterminate	—	1	—	9	6
Distribution Number	0	1	5	40	10

CORRELATION OF THE DEPOSITS

The various deposits described above are set out in Table 4 to show the position which I have attributed to each in the Last (Weichselian) Glaciation.

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Table 4. Correlation of the Deposits, showing their positions in the Last (Weichselian) Glaciation

DEPOSIT	SECTION No.	D. No.*	CORRELATION		
Subaerial loam No. 3 (Lower Part)	Western 7	10	Salpausselka, Central Swedish and Ra moraines	Zone III	Latest Weichselian
	Eastern 5	10			
Subaerial loam No. 2	Western 6	55	Allerød Interstadial	Zone II	Late Weichselian
	Eastern 4	40			
Fine ochreous loam	Western 5	75	Langeland Stadium	Zone I	
Fine ochreous loam	Eastern 3	5			
Subaerial loam No. 1 (Upper Part)	Eastern 2b	1			
Subaerial loam No. 1 (Lower Part)	Eastern 2a	0	Brandenburg Stadium		Middle Weichselian
Upper Coombe Rock	Western 4				
Brickearth	Eastern 1		Brørup Interstadial		
	Western 3	30			
		200			
		105	Early Weichselian		
		1			
Lower Coombe Rock	Western 2				

* Distribution Number.

Obituary

K. H. BARNARD, 1887—1964

KEPPEL HARCOURT BARNARD died suddenly at his home in Cape Town on 22 September 1964: his passing is a severe loss to the sciences of zoology, geology and conchology. He was born in London on 31 March 1887, the only child of HARCOURT GEORGE BARNARD, M.A.(Cantab.), solicitor, of Lambeth and Frensham, and ANNE ELIZABETH (née PORTER) of Royston. BARNARD was educated at a private school in Camberley and at the Realgymnasium in Mannheim, and entered Christ's College, Cambridge, in 1905; he graduated B.A. in 1908 and M.A. (in absentia) in 1913. On going down from Cambridge BARNARD entered the Middle Temple and was called to the Bar in 1911. Preferring natural science to law, he spent a short time as an Honorary Naturalist at the Marine Biological Association's laboratory, Plymouth, before accepting a post as marine biological assistant in the South African Museum, Cape Town, where he became Assistant Director in 1921, Acting Director in 1924 and from 1941 to 1946, and Director from 1946 until his retirement in 1956, when he was appointed Honorary Curator of Mollusca. His research continued after his retirement, and was aided by a Senior Bursary from the South African Council for Scientific and Industrial Research.

In 1915 he married ALICE, daughter of STEPHEN WATKINS of Wolverhampton, a great-grandson of ANDREW FULLER the 'Father' of missionary societies. BARNARD's wife and their two children, JAMES THOMAS HARCOURT BARNARD and Mrs ROSEMARY FREHSE, survive him.

BARNARD received numerous honours, amongst which were Fellow of the Royal Society of South Africa (1920), Fellow of the Linnean Society of London (1921), and D.Sc. of the University of Cape Town (1924) for his thesis on the distribution of Crustacea in South African waters. In 1936 he was awarded the Scott Memorial medal of the South African Biological Society, in 1945 he received the South African medal and grant of the South African Association for the Advancement of Science, and in 1956 he was made an Honorary Fellow of the Royal Society of South Africa. The University of Stellenbosch conferred on him the degree of D.Sc. (honoris causa). He also received the King George V Silver Jubilee medal (1935) and the Queen Elizabeth II Coronation medal (1953).

In 1911, the year in which he left England for South Africa, he joined the Conchological Society of Great Britain and Ireland, and later became a Life Member. He was a Founder Member and one time President of the Conchological Society of South Africa and its first Honorary Life Member. BARNARD was also an enthusiastic mountaineer, being Hon. Secretary of the Mountain Club of South Africa from 1918 to 1945 and winner of the Club's Gold Badge in 1924. He was a Founder Member of

the South African Geographical Society in 1917 and its President in 1936.

BARNARD published more than 200 papers. His monograph on the marine fishes of South Africa (1925-27) is still the most authoritative work on the group. His monographic survey of the South African marine Mollusca, the fifth part of which was published in March 1964, is accepted throughout the world without question. His other interests included Crustacea, on which he published reports for the 'Discovery', 'Terra Nova' and 'John Murray' expeditions, and insects.

BARNARD attributed his interest in Mollusca, including the technique of mounting radulae, to sitting next to HUGH WATSON in the Botany laboratory at Cambridge. His knowledge of the prehistoric and present drainage systems of the western highlands of Cape Province was unequalled, and the drawings with which he illustrated his papers were of high quality. He laboured in the cause of science always, and his great works will be for ever with us to his lasting memory, as will his unselfish example to all who were privileged to know him.

P. ELSTON

K. H. BARNARD: LIST OF PUBLICATIONS ON MOLLUSCA

- 1913 The feeding track of *Oxystele impervia* Menke. *J. Conch.* **14** (3): 80.
- 1927 South African nudibranch Mollusca, with descriptions of new species, and a note on some specimens from Tristan d'Cunha. *Ann. S. Afr. Mus.* **25** (1): 171-215, col. pls. 19-20.
- 1932 Note on the true genus of *Doris* (?) *kalkensis* Barnard. *J. Conch.* **19** (8): 256-57.
- 1933 Description of a new species of *Thecacera*. *J. Conch.* **19** (9): 294-95.
- 1934 A new species of *Goniodoris* from South Africa. *J. Conch.* **20** (1): 2-3.
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- 1957 The radula of '*Latiaxis*' *fritschi*, and description of a new Fossarid. *J. Conch.* **24** (5): 180-81.
- 1957 *Glypteuthria capensis*: a generic correction. *J. Conch.* **24** (6): 210.
- 1958 The radula of *Cancellaria*. *J. Conch.* **24** (7): 243-44.
- 1958 Contributions to the knowledge of South African marine Mollusca. Part I. Gastropoda: Prosobranchiata: Toxoglossa. *Ann. S. Afr. Mus.* **44** (4): 73-163, 1 pl., 30 text-figs.
- 1959 *Latiaxis fritschi* (von Martens) and *Fusus speratus* (Cossman). *J. Conch.* **24** (9): 327.
- 1959 Contributions to the knowledge of South African marine Mollusca. Part II. Gastropoda: Prosobranchiata: Rhachiglossa. *Ann. S. Afr. Mus.* **45** (1): 1-237, 52 text-figs.
- 1960 The rediscovery of *Guivillea* Watson. *J. Conch.* **24** (11): 398.
- 1960 The genus *Charitodoron* Tomlin, 1932. *J. Conch.* **24** (11): 402.
- 1960 Marine molluscs. *News Bull. zool. Soc. S. Afr.* **1** (2): 29.
- 1960 [With J. H. DAY] Check list of Mollusca recorded from False Bay (South Africa). *Spec. Publ. conch. Soc. S. Afr.* **1**: 1-15, map.
- 1960 New species of South African marine gastropods. *J. Conch.* **24** (12): 438-42.
- 1962 A new genus in the family Marginellidae. *Proc. malac. Soc. Lond.* **35** (1): 14-15.



Keppel H. Hamand

- 1962 New species and records of South African marine Mollusca from Natal, Zululand and Moçambique. *Ann. Natal Mus.* **15** (19): 247-54, 4 text-figs.
- 1962 Revised list of South African Late Tertiary and Pleistocene marine Mollusca. *Trans. roy. Soc. S. Afr.* **36**: 179-96.
- 1963 *Fulgoraria blaisei* Barnard. *J. Conch.* **25** (4): 163.
- 1963 Notes on the animals of *Gyrina gigantea* (Lam.) and *Pleurotomaria africana* Tomlin. *Proc. malac. Soc. Lond.* **35** (4): 155-58.
- 1963 *Deep-sea mollusca from the region south of Madagascar*. Pretoria, South Africa: Division of Sea Fisheries. pp. 17, 2 plates. *Investigational Report* No. 44. [Reprinted from *Commerce and Industry*, April 1963.]
- 1963 Deep Sea Mollusca from west of Cape Point, South Africa. *Ann. S. Afr. Mus.* **46** (17): 407-52.
- 1963 Contributions to the knowledge of South African marine Mollusca. Part III. Gastropoda: Prosobranchiata: Taenioglossa. *Ann. S. Afr. Mus.* **47** (1): 1-199, 37 text-figs.
- 1963 The family position of *Afrivoluta pringlei* Tomlin. *J. Conch.* **25** (5): 198-99.
- 1963 Contributions to the knowledge of South African marine Mollusca. Part IV. Gastropoda: Prosobranchiata: Rhipidoglossa, Docoglossa. Tectibranchiata. Polyplacophora. Solenogastres. Scaphopoda. *Ann. S. Afr. Mus.* **47** (2): 201-360, 30 text-figs.
- 1964 Two new genera of Erycinacea (Bivalvia) from South Africa. *Proc. malac. Soc. Lond.* **36** (1): 33-37.
- 1964 Contributions to the knowledge of South African marine Mollusca. Part V. Lamellibranchiata. *Ann. S. Afr. Mus.* **47** (3): 361-593, 39 text-figs.
- 1964 The work of the s.s. Pieter Faure in Natal waters, with special reference to the Crustacea and Mollusca; with descriptions of new species of Mollusca from Natal. *Ann. Natal Mus.* **16**: 9-29, 6 text-figs.
- 1964 An abnormal chiton. *J. Conch.* **25** (6): 240-41.

C. W. PETTITT

REVIEWS

Marine shells of Southern Africa by D. H. KENNELLY. Cape Town: Thomas Nelson & Sons, 1964. pp. [vi] + 92, 2 double-page colour plates, 30 half-tone plates (181 figures from photographs), 15 line-drawings in text. 8vo. Price R2.00 (21s.).

This handbook, written by a member of our Society, is intended primarily for the amateur collector, though the more advanced student will also find it useful. It covers the southern African coast from Mossamedes in West Africa to Moçambique in Portuguese East Africa and deals with those species most likely to be found by shore collectors, with a few from deeper water. The first chapter, 'A short history of Conchology in southern Africa', is rather unusual for such a book, but is most welcome; it contains a list of books on South African shells. Other chapters cover various aspects of shell collecting, from hints to the beginner to Mollusca used as food.

The descriptions of shells are necessarily brief in a book of this size, but are in the main adequate for identification if used in conjunction with the plates. Average dimensions are given and differences between similar species emphasized. The nomenclature is quite up to date. The coloured plates, one of cowries, are from photographs of shells on a floor of sand: the effect is pleasing, though the outline of some of the shells is not too

clear. The figures on the half-tone plates are on a black background: usually where this method is adopted the outline of dark shells is vague, but in the present case this has been avoided and the figures are generally of a high standard.

This is a delightful little book at a reasonable price and most useful to collectors with South African connexions.

L. W. STRATTON

British Palaeozoic Fossils. London: British Museum (Natural History), 1964. pp. 208 (including 69 plates of line-illustrations), coloured map. 8vo. Price 12s. 6d.

Should the amateur naturalist attempt to identify his own specimens, perhaps overlooking thereby some great rarity or novelty, or should he submit all his finds to South Kensington and add to the labours of already overburdened museum-staff? While not presuming to answer this tricky question, the Natural History Museum has given the palaeontologists a broad hint by putting before them an inexpensive 'do-it-yourself kit' in the form of an admirable trio of paperbacks depicting common British fossils. The latest to appear is devoted to the Palaeozoic Era and, in 69 plates of lively pen-and-ink drawings, gives a conspectus of the plants and animals that lived on the site of the British Isles some 225- to 600-million years ago. The fifty or so pages of introductory matter include a generous chapter on stratigraphy, supplemented by folding charts, lists of species for each System, and an article explaining the principles of scientific nomenclature. A coloured map shows the distribution of Palaeozoic strata.

The Palaeozoic Era saw the beginning of most groups of life existing today (not to mention others now extinct) and the Mollusca, for example, were well represented; they are appropriately allotted about one-seventh of the illustrations. On the whole the text conforms to the standard of erudition one expects of the Natural History Museum, with just a few lapses to add piquancy for the pedantic (e.g. '*forchammeri*' for '*forchhammeri*'—p. 24; '*Erbestock*' for '*Erbistock*'—p. 30; '*Tournaisian*' for '*Viséan*'—p. 162, fig. 6). The formidable task of choosing which species to illustrate, which names to give them, and which scheme of stratigraphical classification to follow, has been skilfully handled. Some, however, may find the assignment of the Tremadoc series to the Ordovician (Table II) as provocative as the cession of Co. Fermanagh to Eire (p. 172). Nomenclature for the most part is *avant-garde* and helps to dispel the legendary antiquity of certain Recent genera such as the bivalve *Nuculana*, whose common Carboniferous representative now goes under the name of *Polidevcia attenuata* (Fleming). Here and there a more conservative note is struck, as on p. 100, where the Silurian bivalve now generally known as *Slava interrupta* (Broderip) appears under its old name *Cardiola interrupta*.

Though produced for 'the young, or those without experience', this is a handy reference book for museum curators, university students, and palaeontologists in general.

R. CASEY

Wild Life Observer. London: The Countryman Ltd, September 1964—→. Published monthly at 1s.; subscription rate 16s. per annum, post free.

When *Wild Life Observer*, newly sponsored by the Council for Nature, was re-launched in September 1964, the Director of the editorial board wrote that it was rarely a publisher was able to enjoy his favourite hobby *and* make a contribution to education. It is unfortunate that many teachers find it necessary to sacrifice much of the popular natural history approach to the subject of Biology, owing to examination demands: this magazine continues to help young naturalists meet their wider needs by keeping them in touch with field natural history, with news about nature books, films, records, conservation and field course projects. It is the only magazine to deal basically with British natural history, although some numbers include items from abroad, mainly from the conservation angle. A fair amount of space is given to invertebrates and it is to be hoped that birds, mammals and flowering plants will not be allowed to usurp this: more could be devoted to summaries of the results of special research, such as that on *Nassarius* (April 1965). Molluscs receive passing mention in an article on marine biology excursions promoted by the Council for Nature Youth Committee (January 1965) and again in JOHN CLEGG's essay on pond study methods (May 1965).

Perhaps naturalists are born, not made—but certainly events dictate the slant of young interests, and it is true that lack of stimulating books and articles on molluscs results in comparatively few enthusiasts. Many serious conchologists are people whose interests were aroused when young, so the importance of this magazine is, perhaps, that it offers scope to the experienced conchologist for accounts of various aspects of molluscan life, and that it contains instructive articles for the beginner written in a non-technical style, beautifully illustrated and with an emphasis on 'do-it-yourself'. *Wild Life Observer* is altogether a worthwhile publication for teachers and young students, and one that will be watched for its maintenance of interest in invertebrate groups.

STELLA M. TURK

Van Nostrand's Standard Catalog of Shells edited by ROBERT J. L. WAGNER and R. TUCKER ABBOTT. 1st edition. Toronto, New York and London: D. Van Nostrand Co. Inc., 1964. pp. ix + 190, 221 text-figs., paper covers as col. pls. 8vo. Price \$4.50 (35s.).

The Editors of this work have attempted to provide collectors with a means of assessing the completeness and value of their collections. It is neither a scientific text-book nor a dealer's catalogue, but something between the two. The main part of the book is a list of all the known species of each included genus (arranged in a natural classification), together with a monetary value for each species. The Editors have also tried to provide sufficient illustrations in the text to facilitate the identification of the more common species. For those not so illustrated, references are given to existing illustrations mostly in standard works

obtainable in Great Britain. World size records, determined by a special committee, are included for certain species.

The scientific name of each species is preceded by a catalogue number and followed by the author, date, popular name, usual adult size (in inches) and geographical range. Common synonyms are given and are cross-indexed; subspecies and varieties are placed below the main entry, and are separately priced. The classification used is based on those of Thiele, Wenz and the *Treatise on Invertebrate Paleontology*. Nomenclature is conservative, retaining well-known broad genera in preference to those used in recent revisions, though the more 'modern' genus or subgenus is often placed in brackets immediately preceding the common name: this system should serve the needs of both amateurs and specialists very well.

The following groups are included in this Edition, although some are not covered completely: Monoplacophora; Pleurotomariacea; Emarginulinae; Trochidae; Strombidae; Cypraeidae; Muricidae; Volutidae; Conidae. In their preface, the Editors state: 'The first edition has been limited in scope purposely, since an undertaking of this magnitude will take several years to develop and establish itself. . . . We have attempted to complete in this edition a few of the very popular groups.' It is understood that later editions will include other groups in addition to those contained in the present one.

Of the total of 190 text pages, only 131 comprise the catalogue proper, 11 are introductory in nature and the remainder is taken up with 'quick lists' for American areas, appendices (including a list of Shell Clubs of the world) and a ten-page Index. The text-figures are well executed and should be adequate for identification purposes; more than half of them show two views of the shell, especially in the Cypraeidae.

Two values, in dollars, are quoted for all species where information was available. The higher is for a specimen in good condition with accurate data, and the lower for a fair specimen with incomplete data. The Editors have arrived at these values by considering the abundance, desirability and previous sale prices of the several species. They are only intended as a guide and, as with postage stamps, the condition and provenance will be the deciding factors in fixing a price for any given specimen. Naturally the prices quoted are those obtainable in America, where there is a very active market in shells; it is questionable how far these prices would apply in Great Britain where there is no equivalent trade. The values given range from 1 cent for *Cypraea moneta* or *Conus ebraeus* to 150 dollars for *Cypraea aurantium* or 1,500 dollars for *Cypraea leucodon*. In the light of the recent finds of *Conus gloriamaris* the quoted price of 2,000 dollars should perhaps be viewed with some scepticism.

A few minor faults were noted: it is perhaps misleading that specimens of the Pectinacea, Veneracea and other groups not covered in the text are illustrated in colour on the front cover; the Portland Vase, said to be 'accidentally smashed' was deliberately destroyed by a fanatic; the entry on p. 80—'Genus *XANCUS* Röding, 1798. (*Turbinella* Lamarck, 1799 and of the IZN Commission)'—is tantamount to nomenclatural

anarchy! These small blemishes apart, and allowing for the limited coverage of this first edition, the book achieves its objectives, is easy to use, and constitutes an interesting addition to the literature.

C. W. PETTITT

A monographic Review of the Mollusca of Lake Nyasa by T. E.

CROWLEY, T. PAIN and F. R. WOODWARD, 1964. *Annls Mus. r. Afr. cent. Sér.* 8vo. (Sciences zoologiques) **131**. pp. 1-58, folding map and pls. 1-7. Large 8vo. Price Belg. Fr. 140 (c. 20s.).

With the publication of this work it is now possible to identify molluscs from all the Great Lakes of tropical Africa. MANDAHLBARTH's 'The freshwater Mollusks of Uganda and adjacent territories' (*Annls Mus. r. Congo belge Sér.* 8vo. (Sci. zool.) **32** (1954)) deals with the freshwater molluscs of Lake Victoria and the smaller Uganda lakes. LELOUP's exhaustive and sumptuously illustrated works (*Résult. scient. Explor. hydrobiol. Lac Tanganika* **3** (1) [Lamellibranches (1950)] and **3** (4) [Gastéropodes (1953)]) render the identification of the peculiar molluscs of Lake Tanganyika relatively simple. Until the appearance of the work under review, however, there had been no easy way to identify material from Lake Nyasa other than to look up original references (admittedly conveniently listed by PILSBRY and BEQUAERT in their well-known work on the freshwater molluscs of the Congo) or to compare with large museum collections; the paper, therefore, fills a gap in the steadily growing list of reference volumes available to those interested in African molluscs.

As in the case of Lake Tanganyika, any study of the molluscs of Lake Nyasa is complicated by the species-splitting of J. R. BOURGUIGNAT. The authors, therefore, have had to point out that the number of names available vastly exceeds the number of valid species which they recognize from the lake and the synonymy is extensive, particularly in the case of the genus *Melania* where BOURGUIGNAT allowed his enthusiasm to run away with him and described numerous species and, not content with that, distributed them among four spurious 'new' genera. It does not appear that the authors saw many of the types involved but, since they had a great number of specimens available and BOURGUIGNAT's supposed species are mostly well-figured, this is perhaps not important.

The authors give a concise description of Lake Nyasa and a historical account of the collections made in it, and summarize previous work carried out on the lake. A systematic account of the species follows and a map, plates and list of references complete the work. Some of the plates, notably 3 and 4, are not very clear.

Lake Nyasa is a deep lake, not as deep as Lake Tanganyika but much deeper than Lake Victoria and the smaller Uganda lakes. There is, however, no sign of the strange thalassic forms so characteristic of the deeper lake, owing, no doubt, either to the fact that Lake Nyasa is not as old as Lake Tanganyika or to its becoming so saline during arid periods that the continuity of life in it was severed and a new fauna had to reinvade the lake when its waters again became suitable. The authors,

however, have had to describe a new *Neothauma* and a new *Grandidieria*—genera thought to be restricted to Lake Tanganyika (though known to be more widespread in former times). The authors keep *Bulinus nyassanus* (Smith) and *B. succinoides* (Smith) distinct, whereas MANDAHL-BARTH in his revision of the genus (*Bull. Wld Hlth Org.* **17**: 1–65 (1957)) says of the latter: 'without doubt it represents the immature *nyassanus*, but more material is desirable'. Unfortunately Mr ECCLES found only one immature shell, which is scarcely adequate to reverse MANDAHL-BARTH's decision. Incidentally, according to the references I have available, *succinoides* was first described as a *Physa* and not a *Bulinus* as stated in the work under review. The generic treatment of the Unionidae in this paper differs from that used by MANDAHL-BARTH and LELOUP, but this is a vexed question. The present authors retain *Nyassunio*, *Grandidieria* and *Indonaia*. They have given anatomical data wherever possible.

The authors, and also Mr D. H. ECCLES who supplied the large amount of fresh material that prompted the paper, are to be congratulated on the completion of a most useful work. The paper appears to be almost free from misprints. One rather unimportant error is plainly visible on pl. 7, where fig. 42 is a valve bearing the inscription 'paratype' whereas the caption states 'holotype'. EHRENBURG's name is wrongly spelt on p. 22. A word of thanks is due also to the authorities of the two Belgian institutions responsible for the publication of all three papers dealing with the Great Lakes.

B. VERDCOURT

A Monograph of the African Bivalves of the genus *Pleiodon* Conrad, 1834 by T. PAIN and F. R. WOODWARD, 1964. *Annls Mus. r. Afr. cent. Sér.* 8vo. (Sciences zoologiques) **130**. pp. 1–33, 4 plates, 14 text-figs. Large 8vo. Price not known.

This is the latest in a series of papers on African Mollusca published by the Musée Royal de l'Afrique Centrale, Tervuren, Belgium and produced by various combinations of the trio T. E. CROWLEY, T. PAIN and F. R. WOODWARD. In this paper Mr PAIN deals with the taxonomy of the genus *Pleiodon* (= *Iridina* auctt.) and Mr WOODWARD describes the anatomy of one of the species, *Pleiodon (Cameronia) spekii* (S. P. Woodward, 1859).

The genus *Pleiodon* is divided into two subgenera: *Pleiodon* s.s., containing the two species *P. (P.) ovatus* (Swainson) and *P. (P.) waterstoni* Pain and Woodward, and *Cameronia* with the single species *P. (C.) spekii* (S. P. Woodward). The name *Iridina* Lamarck, 1819, has previously been used for this genus but Mr PAIN clearly demonstrates that the character upon which the type species of *Iridina* has previously been separated from *Mutela* Scopoli, 1777, is in fact found in five species of the latter genus. Nevertheless there are forms separate from *Mutela* for which the first available name is *Pleiodon* Conrad, 1834. As has been found with earlier papers on African Mollusca there were far too many names chasing far too few species. The number of recognized species in the subgenus *Pleiodon* s.s. has been reduced from nine

to two, of which one is newly described in this paper, while in *Cameronia* the number has been reduced from twenty-six to one. The majority of the latter series were the results of Bourguignat's inability to see any resemblances in shells, twenty 'species' being described by him in 1886.

Mr WOODWARD has produced thirteen pages of detailed description of the anatomy of *P. (C.) spekii* accompanied by an equal number of text-figures. He must be congratulated on his painstaking descriptions and the ease with which the reader can follow his account of the anatomy. The text-figures are clear and easily understood by anyone with only the vaguest familiarity with the general anatomy of a bivalve.

This paper maintains the very high standard these authors have set themselves, which is matched by the excellence of the layout of publications from Tervuren. One welcome new feature is the concise explanation of the points of taxonomy, given in the Introduction. This brief abstract immediately furnishes the reader with the necessary knowledge for a full appreciation of the rest of the paper. Mr R. F. CUMBERLAND produced the plates. He has offered his services to the Society in general, and these plates are a good advertisement of his work. The only adverse criticisms of this paper I can advance are that the misprint 'Scopoli, 1888' for 'Scopoli, 1777' in the Introduction could have been avoided, and that occasionally there are 'paragraph' spacings in the middle of paragraphs. It is a pity the shells dealt with are so rarely to be seen in private collections. The authors' fear that the type species may be extinct suggests that there is little or no chance of acquiring specimens of it; however, the very limited collecting that has been done in most of West Africa south of the Sahara leads me to suspect that this may be too pessimistic a view.

C. R. C. PAUL

The eutrophic lake Borrevann (Norway)—an ecological study on shore and bottom fauna with special reference to gastropods, including a hydrographic survey by JAN ÖKLAND. Oslo: Universitetsforlaget, 1964. pp. 1-337, with 118 figures, 56 + XI Tables, and 3 colour photographs. *Folia limnol. scand.* **13**. Large 8vo. Price 45 Norw. Kr. (c. 45s.).

This volume maintains the high standard which has been characteristic of its predecessors in the series. The study is concerned with the macroscopic bottom fauna of the eutrophic Lake Borrevann in south-east Norway. Detailed physico-chemical data about this lake are followed by an account of the zoological investigations, which were both qualitative and quantitative in nature. A total of 274 different species or groups of invertebrates is recorded, 21 of which are new to Norway; 33 characteristic species of vertebrate are also noted. The average standing crop of bottom fauna was found to be 1913 individuals per m², weighing 259.3 gm (wet weight); *Anodonta piscinalis* Nilsson makes up a very large part (248.2 gm) of this weight, however, though only a small part of the number (10 individuals per m²).

Of special interest to readers of this Journal is the account of the Mollusca of Lake Borrevann—a detailed study was made of the thirteen

species of freshwater Gastropoda which occur there, special samples of this group (based on a standard time/collection method) being taken for the purpose, independent of the general bottom fauna sampling. The main purpose of this part of the study was to describe the horizontal and vertical distribution of Gastropoda within the lake and the distribution pattern in ditches and swamps near the lake. *Lymnaea truncatula*, *L. glabra*, *L. peregra*, *L. auricularia*, *Physa fontinalis*, *Aplexa hypnorum*, *Bathyomphalus contortus*, *Gyraulus acronicus*, *G. crista*, *Hippeutis complanatus*, *Acroloxus lacustris*, *Valvata cristata* and *V. piscinalis* are the species concerned, and all occur in the lake itself, with the exception of *Aplexa hypnorum* which is found in ditches close to the lake. An account of each of these species in the area is followed by a comparison with published data on Gastropoda in other European lakes. Of the Bivalvia, *Anodonta piscinalis*, *Sphaerium corneum* and eight species of *Pisidium* are recorded from Lake Borrevann, and a short account of each of these species is included.

The reviewer has little other than praise for Dr ÖKLAND's contribution, which must undoubtedly be accepted as one of the classic lake studies which have been carried out to date. The text, figures and plates (three of which are coloured) are of a high quality and only a few typographical errors (e.g. 'amphibium' for 'amphibian'—p. 107) were noted. Occasionally there are statements which appear slightly ambiguous (e.g. 'Emphasis was laid on getting a general idea of 'average' conditions in the lake, mainly based on summer samples.'—p. 283), whilst the spelling of certain scientific names (e.g. *Oxyethiera* and *Prodiamesia*) was unfamiliar to the reviewer (cf. KLOET & HINCKS, 1945. *A check list of British insects*. Stockport.). Anyone who has carried out a study of this type will be only too aware of the enormous amount of time and labour involved, and thus any query concerning the lack of information on Oligochaeta and small Crustacea in Lake Borrevann is more an indication that the reviewer's appetite was whetted for more, rather than a legitimate criticism.

PETER S. MAITLAND

PROCEEDINGS OF THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND

816th Meeting, held at the British Museum (Natural History),
17 October 1964

The President, Dr M. P. KERNEY, in the Chair.

Members Deceased

The President reported the deaths of Dr K. H. BARNARD, Dr F. DE HAVAS, Mr A. E. SALISBURY and Miss A. M. SAUNDERS.

Communications

'The taxonomic status of *Conus imperator* (Woolacott)', by W. O. CERNOHORSKY.

'*Arion lusitanicus* Mabilie in Cornwall', by A. E. ELLIS.

'Note on *Vitrea contracta* (Westerlund)', by J. G. J. KUIPER.

'*Cecilioides acicula* (Müller) as a garden snail', by L. W. STRATTON.

'An interstadial horizon of the last glaciation at Halling, Kent', by Major J. P. T. BURCHELL.

Exhibits

Special exhibit: fossil Cephalopoda, introduced by Mr P. E. NEGUS and Mr T. PAIN; examples were also shown by Mr D. G. PICKRELL and Mr R. P. SCASE.

Mr A. E. ELLIS: living slugs, dissections and diagrams to illustrate his paper.

Mr L. W. STRATTON: land and freshwater shells recently collected in Greece, Spain and Finland.

Mr P. J. WIMBLETON staged an exhibit of collecting apparatus.

817th Meeting, held at the British Museum (Natural History), 14 November 1964

The President, Dr M. P. KERNEY, in the Chair.

Member Deceased

The President reported the death of Mr EDWIN W. FLETCHER.

Members Elected

WOLF-DIETRICH BEER, Dr rer. nat., Funckenburgstrasse 12, Leipzig C.1, German Democratic Republic.

Mrs JULIA M. COBB, 186 Bedford Road, Sutton Coldfield, Warwickshire.

Mr ANDREW PETER DOW and Mrs RHODA ELIZABETH DOW, c/o Outward Bag Room, The Foreign Office, London S.W.1.

Revd Canon CHARLES ELLIOT FOX, M.A., Litt.D., Taroaniara, via Honaira, British Solomon Islands Protectorate.

Miss RHODA HEMMINGS, B.Sc., 3 Pinfold Lane, Repton, Derbyshire.

BERNHARD KLAUSNITZER, stud. biol., Fetscherstrasse 39, Dresden A.19, German Democratic Republic.

MICHAEL JOHN MORPHY, Manor Croft, 64 Cop Lane, Penwortham, Preston, Lancashire.

IAN DAVID SIMPSON OGILVY, The Lodge, East Newport-on-Tay, Fife and S.S. *Anadara*, c/o Shell Tankers (U.K.) Ltd, Shell Centre, London S.E.1.

ROY J. PURROTT, 62 Meadway, Barnet, Hertfordshire.

Miss BETTY RAE, Holloways School, Barley, Royston, Hertfordshire.

BARRY RAWLINSON, 53 Waverley Road, St Albans, Hertfordshire.

ARTHUR SAYERS, 11 Fourth Avenue, Rush Green, Romford, Essex.

GERAINT THOMAS WARD, B.A., 4 Meadowfield Road, Bridlington, Yorkshire.

Dr GLENN R. WEBB, Science Department, Kutztown State College, Kutztown, Pennsylvania, U.S.A.

RENDEL BRIAN GLANVILLE WILLIAMS, B.A., Merrion Gate, Gazeley Lane, Trumpington, Cambridgeshire.

Revd G. K. WRIGLEY, M.A., Church Cottage, St Mawes, Truro, Cornwall.

Communications

'Note on the Mollusca of Grange-over-Sands', by J. O'N. MILLOTT.

'The eastern limit of *Monodonta lineata* (da Costa) in the English Channel', by J. B. HAWTHORNE.

'Mollusca from the Dahlak Archipelago, Red Sea', by H. E. J. BIGGS.

'*Littorina* from Eilat', by H. E. J. BIGGS.

Exhibits

Special exhibit: *Lymnaea*, introduced by Mr L. W. STRATTON and Mr T. PAIN; examples were also shown by Mr C. P. CASTELL, from the British Museum collections, by the Revd H. E. J. BIGGS and by Mr D. G. PICKRELL.

Mr G. A. S. BARNACLE: shells dredged from the R. Arun at Coldwaltham, West Sussex (including *Anodonta complanata* Rossmässler).

Revd H. E. J. BIGGS: specimens to illustrate his papers.

Mr P. E. NEGUS: an article by Dr ALEX COMFORT on 'Molluscan shell patterns' in *Animals* 5 (5): 131-35 (10 November 1964).

Mr. R. P. SCASE: two rare cone shells, viz *Conus recurvus* Broderip from the Lower Gulf of California and *C. villepini* Fischer & Bernardi from 78 fathoms SSW. of Morgan City, Louisiana, U.S.A.

818th Meeting, held at the British Museum (Natural History), 12 December 1964

The President, Dr M. P. KERNEY, in the Chair.

Member Deceased

The President reported the death of Dr L. BRYAN LANGMEAD.

Members Elected

T. F. HIGHAM, M.A. (Emeritus Fellow of Trinity College), 26 Northmoor Road, Oxford.

JOHN LLEWELLYN JONES, Honan, West Mersea, Essex.

DEMETRIOS MICHAELIDES, 11 North Audley Street, London W.1.

County Borough of Sunderland Public Libraries, Museum and Art Gallery, Borough Road, Sunderland, Co. Durham.

Mrs THORA P. WHITEHEAD, Springfield, Crouch House Road, Edenbridge, Kent.

Communications

'Notes on *Argobuccinum gemmifera* (Euthyme)', by D. H. KENNELLY.

'The dates of publication of J. D. W. HARTMANN's *Erd- und Süßwasser Gasteropoden*', by D. HEPPELL.

'*Arion lusitanicus* Mabilie in Devon', by A. E. ELLIS.

'List of finds of *Conus gloriamaris* Chemnitz in New Guinea, 1963-64', by M. R. HAYES.

'The correct name for an African *Bulinus*', by B. VERDCOURT.

Exhibits

Special exhibit: *Theba*, introduced by Mr J. F. PEAKE, illustrated with specimens and colour slides; examples were also shown by the Revd H. E. J. BIGGS and Mr L. W. STRATTON.

Mr T. PAIN: *Archachatina (Megachatinopsis) papyracea* (Pfeiffer) and *A. (M.) knorrii* Jonas.

Mr R. P. SCASE: *Argobuccinum gemmifera* (Euthyme), East London, South Africa, and documents and photographs concerning *Conus gloriamaris* Chemnitz.

Dr B. VERDCOURT: *Cerastua erlangeri* Kobelt, Gara Mulata Mountain, Ethiopia, collected by W. BURGER.

819th Meeting, held at the British Museum (Natural History), 16 January 1965

The President, Dr M. P. KERNEY, in the Chair.

Member Deceased

The President reported the death of Dr A. O. DE ZARATE.

Members Elected

MARK CULME-SEYMOUR, Frome House, Frome St Quintin, Dorset.

J. C. KENWORTHY, P.O. Box 37, Honaira, Guadalcanal, British Solomon Islands Protectorate.

PETER S. MAITLAND, Ph.D., Department of Zoology, The University, Glasgow W.2.

LESLIE J. WOLFF, Newton Park College, Bath, Somerset.

Communication

'The marine shells of Malta', by H. E. J. BIGGS.

In connexion with the above paper, an illustrated lecture on methods of submarine research in the Mediterranean was delivered by Mr CHRIS WILKINSON who, with the leader Mr JOHN WOODS, described a recent biological expedition to Malta.

Exhibits

Special exhibit: marine shells of the western Mediterranean, introduced by the communication and lecture noted above; shells from Malta, both marine and non-marine, were shown by the Revd H. E. J. BIGGS and by Mr R. P. SCASE, and live Maltese Mollusca in seawater were shown by Mr A. BLOK.

Dr J. LLEWELLYN JONES: marine shells from an old collection.

Mr T. PAIN: *Pleurodonte aspera* (Férussac) found in the cabin of a Dover Pilot Cutter.

Mr R. P. SCASE: the rare volutes *Ericusa sericata* Thornley and *Relegamoria mollerii* Iredale.

ACCOUNTS FOR THE YEAR ENDING 31 DECEMBER 1964

Income and Expenditure Account

[illegible]

Life Membership Fund

Dr.				Cr.
	£	s.	d.	
To Amount of Fund, 31 December 1963 ..	670	0	0	
Dividends and Interest from Dividend Account	27	0	0	
	<u>£697</u>	<u>0</u>	<u>0</u>	
				By Transfer to Income and Expenditure Account
				Amount of Fund, 31 December 1964 ..
				£697 0 0

Reserve and Research Fund

Dr.		Cr.
	£ s. d.	£ s. d.
To Amount of Fund, 31 December 1963 ..	1021 0 0	
Dividends and Interest from Dividend Account ..	38 0 0	
	£1059 0 0	
By Junior Membership formation papers Amount of Fund, 31 December 1964 ..		70 0 0 989 0 0
		£1059 0 0

* A sum of about £300 is due to the printers for Volume 75, part 7

Dividend Account

Dr.					Cr.	
	£	s.	d.		£	s.
To 3½% Defence Bonds	13	6	11	By Transfer to Life Membership Fund	27	0
4% Funding Loan	16	6	6	Transfer to Reserve and Research Fund	38	0
3% Funding Loan	3	0	0	Transfer to Income and Expenditure Account	61	5
3½% War Stock	1	8	4			
4½% Defence Bonds	9	0	0			
3½% Defence Bonds	14	0	0			
5% Treasury Stock	20	0	0			
4% British Gas Stock	16	0	0			
3% Savings Bonds	6	0	0			
5½% City of Norwich Mortgage Loan	13	15	8			
Post Office Savings Bank	4	10	3			
Income Tax refund	8	17	9			
	£126	5	5		£126	5

Balance Sheet

Dr.					Cr.	
	£	s.	d.		£	s.
LIABILITIES				ASSETS		
To Membership Fees paid in advance	47	8	9	By 4% Funding Loan (Cost)	350	0
Subscriptions paid in advance	30	1	6	3% Funding Loan (Cost)	81	10
Life Membership Fund	670	0	0	4½% Defence Bonds (Cost)	200	0
Reserve and Research Fund	989	0	0	3½% War Stock	20	0
Capital Stock	800	0	0	5% Treasury Stock (Cost)	344	0
Balance, 1 January 1964	637	11	6	4% British Gas Stock (Cost)	324	10
Less Depreciation on 3½% War Stock	£20	0	0	3% Savings Bonds (Cost)	143	5
Less Purchase L.C.C.				5½% City of Norwich Mortgage Loan (Cost)	400	0
Stock shown at cost (£769 4 0)	£30	16	0	5½% London County Council Mortgage Loan (Cost)	769	4
	50	16	0		2632	9
	586	15	6	Cash:		
Transferred from Income and Expenditure Account	228	15	3	At National Provincial Bank	516	18
	815	10	9	At Post Office Savings Bank	202	13
	£3352	1	0		719	12
					£3352	1

NOTE: In addition to the Assets shown above are outstanding subscriptions and debts and the stock of Journals valued at about £300.
Examined and found correct.

M. MAITLAND HOWARD } Auditors.
P. COXHEAD
29 January 1965

C. A. RAFFRAY,
Hon. Treasurer.
7 January 1965

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* = new name

vcr = new vice-county record

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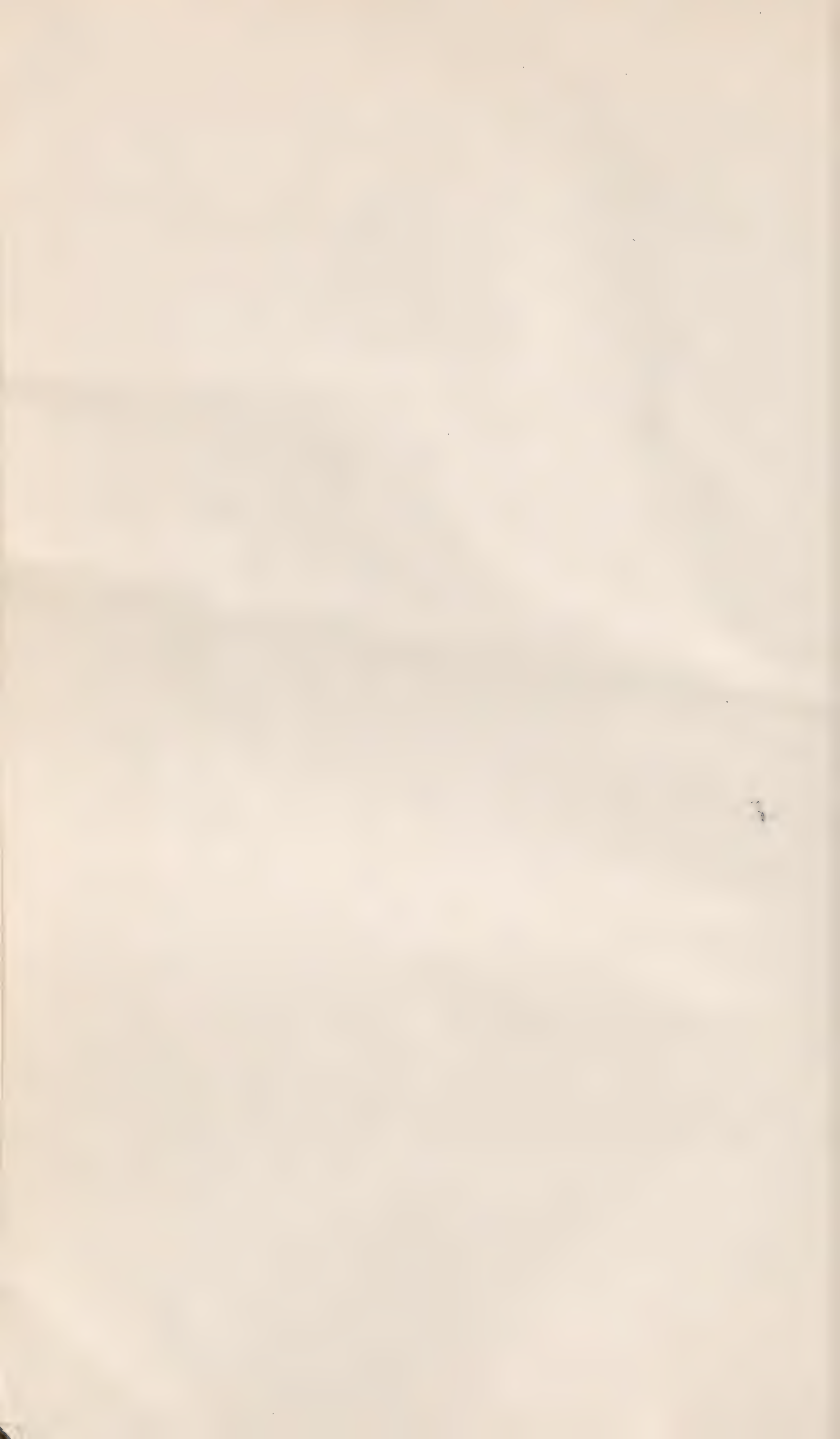
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BRITISH NON-MARINE MOLLUSCA

SUPPLEMENT
TO THE 7TH EDITION

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**CENSUS OF THE DISTRIBUTION OF
BRITISH NON-MARINE MOLLUSCA**

**SUPPLEMENT
TO THE 7TH EDITION**

FOREWORD

The following notes are intended as a Supplement to the Conchological Society's most recent Census, published on 24 October 1951 (*J. Conch.* **23**: 171–244). As pointed out by A. E. ELLIS in the foreword to that edition, the distribution of most species on a vice-comital basis was by then very fully known, and the last fourteen years have indeed modified the general picture to only a slight extent. Increments since that date have appeared annually in the Recorder's Report in the *Journal of Conchology* (**23**: 303, 345, 417; **24**: 69, 151, 222, 295, 365, 415; **25**: 48, 93, 215, 305; **26**: 77) and are reprinted below in a more convenient form, together with some comments and emendations. New fossil records have mostly been omitted, since it is apparent that the geological information contained in the Census requires a degree of revision beyond the scope of this Supplement. The geological table on p. 176 similarly needs modification. [For an up-to-date synthesis of the British Quaternary see WEST (1964).]

A few omissions and errors were corrected in 1953 (*J. Conch.* **23**: 303), as follows:

- p. 182. Insert subgenus ARMIGER Hartmann before *P. crista*.
- p. 197. Insert subgenus PSEUDANODONTA Bourguignat before *A. minima*.
- p. 200. *Physastra dispar* (Sowerby) [not Tapparone].

Records contained in the Census notebooks are being incorporated in the new 10-kilometre-square mapping scheme adopted by the Society (*J. Conch.* **25**: 123, 307), and in the process a few mistakes in the attribution of records to their vice-counties have come to light. These are corrected below in List A, while List B contains all other additions and corrections up to November 1965.

M. P. KERNEY

Department of Geology,
Imperial College,
London S.W.7
24 November 1965

A. Correction of Records previously attributed to the wrong Vice-County

In the following list, 'delete' indicates that the species in question has already been recorded for the vice-county to which it correctly belongs.

- Cornwall W. (1): transfer *Monacha cantiana* (dead shell) to v.c.2 (*J. Conch.* 23: 417).
 Wilts N. (7): delete *Pisidium personatum*.
 Worcester (37): delete *Succinea putris*.
 Salop (40): delete *Anodonta minima*.
 Perth Mid (88): delete *Pisidium obtusale*.
 Easternness (96): delete *Lauria anglica* and *Helix nemoralis*; transfer *Monacha granulata* to v.c.97.
 Westernness (97): delete *Acanthinula aculeata*, *Pisidium obtusale* and *P. milium*.
 Mayo W. (138): transfer *Vallonia excentrica* to v.c.139.

B. Additions and Corrections to Tables of Distribution

- Theodoxus fluviatilis*: 3 (unconfirmed), 59, 133.
Viviparus viviparus: delete 83.
Viviparus contectus (Millet) = *V. fasciatus* of Census, non Müller (WATSON, 1955).
Valvata macrostoma: 23.
Valvata piscinalis: 110.
Pomatias elegans: 30, 49, 59 (dead shell).
Acicula fusca [= *Acme fusca* of Census]: 2, 13, 16, 56, 70.
Hydrobia neglecta Muus. Formerly confused with *H. ventrosa*, but recently recognized in Denmark as a distinct species (MUUS, 1963). Found living in North Uist (v.c.110) by Dr T. WARWICK in 1964 (*J. Conch.* 25: 314). Empty shells probably of this species have also been seen from Herm (v.c.0).
Hydrobia ulvae: 0, 1a, 72, 90.
Potamopyrgus jenkinsi: 1a, 71, 73, 74, 75, 77, 78, 79, 81, 82, 93, 94, 95, 96, 97, 98, 102, 108, 120. The large number of recent records for Scotland suggests that the species is still actively extending its range.
Bithynia tentaculata: 72, 95, 102.
Bithynia leachi: 58.
Carychium minimum seg., *Carychium tridentatum*. Both species are now known to be widespread and probably occur in nearly all vice-counties. For discussion and illustrations see WATSON & VERDCOURT, 1953.

- Leucophytia bidentata*: 1a, 13 (dead shells, *J. Conch.* 26: 34), 82, 98, 100.
Phytia myosotis: 0, 1a, 2, 52, 69, 98.
Lymnaea truncatula: 102.
Lymnaea catascopium. Now extinct at Leith (D. K. KEVAN, *in litt.*).
Lymnaea stagnalis: 0, 70, 72, 79, 85, 98.
Lymnaea auricularia: 96.
Lymnaea glutinosa: 48.
Aplexa hypnorum: 48, 99.
Physa sp. (introduced species): 62.
Planorbarius corneus: 60, 69, 72, 77, 82, 83, 99.
Menetus dilatatus. Not confirmed for Raasay, in spite of careful search (A. R. WATERSTON, *in litt.*).
Planorbis carinatus: 77, 85, 89, 98, 99.
Planorbis planorbis: 77.
Planorbis vorticulus: 21 (Staines, *J. Conch.* 24: 403).
Planorbis vortex: 85, 140N. Unconfirmed records for 113, 115, 146E and 146M almost certainly incorrect, that for 122 doubtful (A. W. STELFOX, *in litt.*).
Planorbis leucostoma: 99, 104.
Planorbis laevis: 2, 17, 99, 127 (dead shell).
Planorbis albus: 91, 93, 96.
Planorbis crista: 74, 99.
Planorbis contortus: 91, 102.
Segmentina complanata: 74, 93.
Segmentina nitida: delete 95.
Acroloxus lacustris: 48, 51, 148N.
Succinea oblonga: 15, 119E, 123, 141, 147, 148S.
Succinea pfeifferi: 102.
Cochlicopa lubricella (Porro) = *C. minima* of Census. Verified from: 1a, 1, 4, 8, 11, 12, 13, 15, 16, 17, 20, 23, 24, 27, 29, 30, 33, 40, 41, 45, 49, 50, 51, 52, 56, 58, 59, 60, 64, 70, 74, 75, 78, 81, 82, 83, 87, 88, 92, 97, 100, 102, 104, 105, 108, 110, 111, 113, 114, 122, 124, 146M, 147. Widespread, though probably having a more discontinuous distribution than *C. lubrica* seg. For ecology and illustrations see QUICK, 1954.
Pyramidula rupestris: 58, 104, 108.
Columella edentula: 1a, 13, 111. The fossil record for the Norwich Crag is an error.
Truncatellina cylindrica: 9, 66.
Vertigo antivertigo: 13, 18, 51.
Vertigo substriata: 2, 8, 20.
Vertigo pygmaea: 40, 55, 102.
Vertigo genesii. The form living in Ireland and in most of the relict colonies in lowland Europe is *V. genesii geyeri* Lindholm, which may merit specific rank (KERNEY *et al.*, 1964).
‘*Vertigo parcedentata*’. The British fossil shells referred to this species belong to *V. genesii* s.s.

- Vertigo moulinsiana*: 126.
Vertigo lilljeborgi: 97.
Pupilla muscorum: 72, 102.
Lauria sempronii (Charpentier). Recognized from Holocene deposits of Neolithic or post-Neolithic date in 13, 15 and 16 (*J. Conch.* 24: 183). South and SE. Europe, mainly montane.
Lauria anglica: 1, 46, 57, 72, 99.
Abida secale: delete 17 (recorded *J. Conch.* 23: 303, but not verified).
Acanthinula aculeata: 77.
Acanthinula lamellata: 22, 45, 48, 49, 108.
Vallonia costata: 58, 140N.
Vallonia pulchella: 22, 24, 64.
Vallonia excentrica: 2, 34, 113, 115, 119W, 132, 139, 140N, 147.
Ena montana: 20 (*J. Conch.* 24: 102).
Ena obscura: 72.
Clausilia rolphi: 34.
Laciniaria biplicata: 16 (extinct).
Balea perversa: 47, 108.
Ceciloides acicula: 51, 132.
Testacella maugei: 2.
Testacella haliotide: 80.
Testacella scutulum: 60.
Theba pisana: 1 (*J. Conch.* 26: 19, confirmation of old record), 21 (adventive, now extinct).
Hygromia subrufescens: 105, delete 17 (*J. Conch.* 25: 108).
Hygromia striolata: 97, 102.
Hygromia hispida. The systematics of this species or group of species in Britain needs further investigation (FORCART, 1965).
Hygromia liberta: 20, 22, 24, 64.
Monacha granulata: 99, 105.
Monacha cartusiana: 1 (unconfirmed).
Monacha cantiana: 45, 85 (*J. Conch.* 24: 406).
Helicella gigaxi: 56.
Helicella virgata: 72.
Helicella neglecta. Probably now extinct at Luddesdown in 16.
Helicella itala: 2.
Cochlicella acuta: 72, 105, delete 83. Extinct at Greenhithe in 16 (*J. Conch.* 24: 255).
Arion intermedius: 1a.
Arion circumscriptus: 1a. LOHMANDER (1937) and WALDÉN (1955) consider that in Scandinavia two, if not three, species have been confused under this name, all of which occur in Britain. In particular, they distinguish under the name of *Arion fasciatus* the form with yellowish lateral areas below the main body bands (= var. *flavescens* Collinge; TAYLOR, *Monograph of the Land and Freshwater Mollusca of the British Isles* 2: pl. 24, fig. 14). For a full discussion see LOHMANDER 1937.

Arion subfuscus: 18.

Arion lusitanicus: 1a, 1, 2, 3, 8, 38, 49. For diagrams of the genital anatomy of specimens from Cornwall and Devon see ELLIS (1964; 1965).

Arion rufus: 1, 3, 9, 15, 17, 23, 38, 55, 56, 69, 93.

Euconulus fulvus: 1a. The form *alderi* Gray, 1840 (in TURTON, *Manual of the Land and Fresh-water Shells of the British Islands*: 148; figured by LOŽEK, 1964: pl. 19), is regarded by some continental authors as at least subspecifically distinct. A number of English and Irish localities are given by TAYLOR (*Monograph* 3: 123).

Vitrea contracta. Verified from: 0, 1a, 1, 2, 3, 5, 9, 12, 13, 15, 16, 17, 19, 20, 22, 23, 24, 36, 40, 41, 45, 49, 50, 51, 56, 57, 58, 59, 60, 62, 64, 69, 70, 76, 82, 83, 84, 85, 87, 88, 89, 95, 96, 97, 100, 104, 105, 108, 110, 111, 113, 115, 131, 132, 135, 138, 140N, 141, 146M, 148N, 148S. Widespread in suitable habitats. Figured by KUIPER, 1964.

Oxychilus draparnaldi: 22, 33, 56, 58.

Oxychilus helveticus: 45.

Retinella pura: 45.

Zonitoides excavatus: 140N.

Vitrina pellucida: 102.

Vitrina major: 15, 17 (*J. Conch.* 24: 235).

Milax gagates: 30, 58.

Milax cf. *M. insularis* (Lessona & Pollonera): 14 (Bexhill, QUICK, 1960).

Milax sowerbyi: 58, 59.

Milax budapestensis: 8, 11, 15, 22, 29, 52, 56, 63, 100, 102, 115.

Limax tenellus: 69.

Limax cinereoniger: 9, 16, 73.

Limax flavus: 111.

Agriolimax agrestis: 110 (*J. Conch.* 25: 14, confirmation of record).

Agriolimax caruanae: 1a, 8, 9, 20, 23, 59, 111, 115, 146E, 146M (*J. Conch.* 24: 354).

Agriolimax laevis: 0, 1a.

Since 1951, a handbook for the identification of all British freshwater bivalves has become available (ELLIS, 1962).

Margaritifera margaritifera: 111 (*J. Conch.* 26: 69, old record). Probably now extinct in Orkney.

Anodonta cygnea: 72.

Anodonta anatina: 10, 57, 75, 76, 86, 99. The continued use of this name in the accepted British sense is at present *sub judice*. For discussion see *Bull. zool. Nom.* 21: 432 (1964); op. cit. 22: 213 (1965).

Anodonta complanata Rossmässler = *A. minima* of Census, non Millet (BRANDER, 1956): 9, 11, 13, 22, 31, 35.

Sphaerium transversum: 13.

Sphaerium lacustre: 74, 79, 99, 118.

Pisidium amnicum: 79.

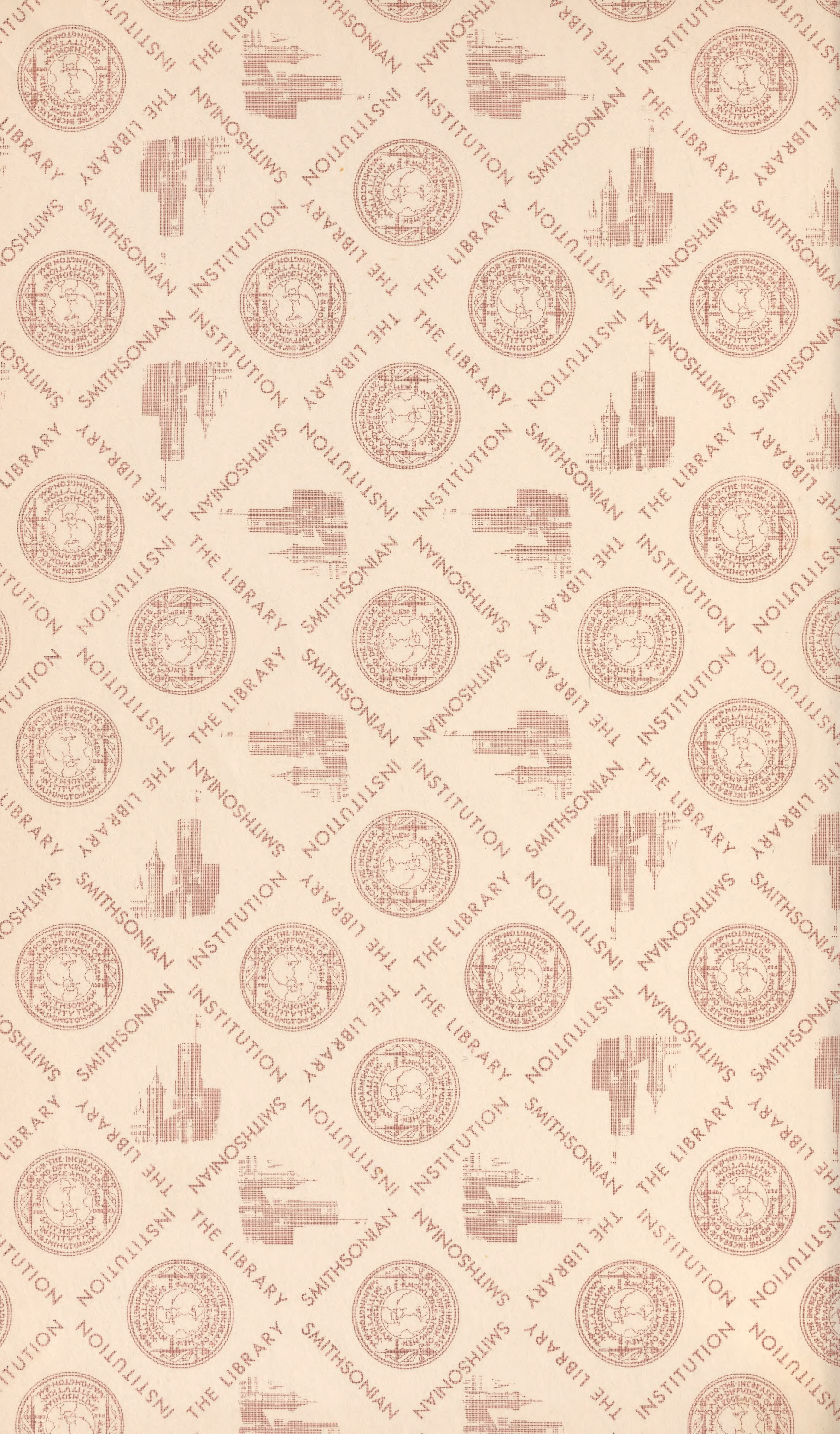
- Pisidium casertanum*: 18, 76, 80, 102.
Pisidium conventus: 88, 99 (*J. Conch.* 24: 245).
Pisidium personatum: 24, 76, 80, 102.
Pisidium obtusale: 18, 22, 75, 76.
Pisidium milium: 76.
Pisidium pseudosphaerium: 58 (Bromborough, *J. Conch.* 25: 63).
Pisidium subtruncatum: 76, 79, 99.
Pisidium henslowanum: 69, 70, 99.
Pisidium lilljeborgi: 48, 77.
Pisidium hibernicum: 11, 14, 75, 89.
Pisidium nitidum: 93, 99, 104.
Pisidium pulchellum: 63, 64, 87.
Pisidium moitessierianum: 6.

Adventives

- Helicella cespitum* (Draparnaud): 9 [Sherborne].
Helix lactea Müller: 15 [Dover].

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